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(Assisted by several Scientific Gentlemen.)

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No. CLXIV.

RECENT PATENTS.

To THOMAS UNSWORTH, *of Derby, silk weaver, for his invention of an improved manufacture of elastic fabric.*—[Sealed 2nd November, 1844.]

THIS improved manufacture of elastic fabric is designed to produce ornamental elastic articles of silk (and other fibrous materials, if required), having velvet surfaces, or portions of velvet or plush; that is, a pile on one or both faces of the fabric; the ground being of any of the ordinary kinds of woven-work, twist-work, or gauze-work, and the velvet or pile wrought in or upon the ground, in stripes, or various devices or patterns. It is proposed, also, to introduce occasionally into the ground work, and also into the velvet, embroidered figures or devices of gold, silver, or colors; and into the fabric are worked either elastic cords or wire springs, or strands of India-rubber, either covered or uncovered with any filamentous materials: the India-rubber, after the fabric is finished, may be rendered elastic by heat, in the ordinary way.

This fabric may have open edges of net-work, of any kind or form of meshes or interstices, with fancy work wrought in the net. The goods, when finished, are intended for frills or plaited bands, collars, flounces, fringes, and other ornamental trimmings, principally for ladies' dresses; the fabric being puckered, plaited, or drawn up into flutes, by the intro-

duction of elastic cords, inserted in loops, or by strands woven into the material, as above stated.

This fabric is produced in an ordinary loom, furnished with the several kinds of warps suited to the work to be made, of silk or other materials, and suitable kinds of weft are to be shot in during the weaving, consisting of threads or cords of gold, silver, and colored silks, according to the desired pattern. For making the velvet or pile parts, wire may be introduced into the work, as usual; or any of the other known modes of raising loops and pile may be had recourse to.

A draw-boy is to act upon the figuring harness of the loom, or some of the modifications of the Jacquard may be employed. The warp for the net-work, tatting, gauze, or other fringe, on the edges, is to be of double or single threads and cords; and those parts of the warp intended to make these edgings must be crossed, in order to get the tie of each mesh.

In order to describe the operations requisite for carrying out the invention, several views are shewn, of an ordinary loom, with an arrangement of parts capable of producing the improved fabrics.

In Plate I., fig. 1, is an elevation of the front of a loom so arranged; fig. 2, is a side elevation of the same; and fig. 3, a horizontal section, shewing the warp-beams. A, A, are the standards of the loom; B, the lathe or batten; C, the headles or harness; D, the beam on which the yarns to constitute the main portions of the warp or ground of the fabric are wound; E, is the beam containing the threads for producing the warps of the gauze or net; F, is the beam which carries the India-rubber (where that is employed to form the elastic strands); G, G, are beams for carrying the threads or yarns which produce the pile; H, is the beam for carrying the fancy yarns to be acted upon by a Jacquard; I, is the rack-wheel, fixed on the end of the breast-beam, gearing into a train of wheels, communicating, by rods, with the treadle K, by which the work, as it is woven, becomes gradually wound upon the beam. The several headles of the harness are connected to their respective warps in the ordinary way, according to the kind of work intended to be made.

The three headles *a*, *b*, and *m*, (see fig. 2,) are intended to operate upon the gauze or net-yarns of the beam E; the headle *c*, works the India-rubber yarn from the beam F; the headles *d*, *e*, act upon the pile-yarns, from the beams G, G; and the headles *f*, *g*, *h*, *i*, work the ground-warps from the beam D. The headle *k*, acts counter to *a*, and *m*, and the headle *l*, to *b*, in operating the gauze-warps. All of which headles are connected to, and actuated by, the several treadles at bottom. The fancy warps, from the beam H, are intended to be worked by hand, by a draw-boy, or by a mounture (not shewn), in connection with the Jacquard.

The work is made by the use of two shuttles, or three, in the event of introducing satin figures with the velvet figures. These shuttles are placed in the moveable boxes L, L, which are raised and depressed, when so required, by the ordinary means known to weavers.

In producing work having a double pile, the headles *a*, and *m*, are first depressed, and the headle *b*, raised, for opening the shed of the gauze-threads; the India-rubber warp is also depressed, by sinking the headle *c*; and at the same time the two headles *d*, *e*, are depressed, in order to throw the pile-yarns below; half of the ground-warps are likewise, at this time, thrown below, and the other half above, by depressing the headles *g*, *i*, and raising *f*, *h*. The weft-thread is then thrown across by the binding-shuttle, and the batten beats up the work. In the second operation, the actions of all the above-mentioned headles are reversed, except that of the India-rubber *c*, which again opens the shed of the warps; the weft is then thrown across and back again by the same shuttle, and beaten up as before. At the third opening of the sheds, the headles *a*, *m*, are raised, and the headle *b*, depressed, as in the first operation; the India-rubber is brought up, by raising the headle *c*; and the pile-headles *d*, *e*, are depressed. Of the ground-headles, *f*, *g*, *h*, are raised, and *i*, sunk, and then the weft is to be thrown across by the same shuttle, which will bind the India-rubber strands to the back of the work.

At the fourth operation, the headles of the pile-warps *d*, *e*, are raised, and all the other warps depressed; the wires

for forming the loops of the pile, are then introduced. The fifth operation is effected by sinking the headles *a*, and *m*, and raising *b*, and depressing the India-rubber warp, and also the pile-warps, by sinking the headles *c, d, e*; the ground-warps are divided, as in the first opening; and the weft is thrown across by the same shuttle, and then beaten up. In the sixth operation, the headles *a*, and *m*, are to be raised, and *b*, and *c*, depressed, and the pile-headles *d, e*, raised; the ground-warps are also to be divided, raising *g, i*, and sinking *f, h*; the weft is then thrown by the same shuttle, and beaten up. At the seventh opening of the sheds, the headles *a, m*, are to be raised, and *b*, and *c*, depressed; the headles *d, e*, are also depressed, and *f, h*, raised, and *g, i*, are likewise depressed; the weft is thrown from the same shuttle, and beaten up as before. In the eighth opening of the sheds, the whole of the headles are raised, except *d, e*, which are depressed; the shuttle-box L, is then raised, and the shuttle that carries a coarser temporary thread, as a substitute for a wire, is brought into operation. This thread is then thrown across as a weft, but is to be ultimately drawn out, or cut out, according to whether terry or pile are required—the work is then beaten up. At the ninth opening of the sheds, the headles *d, e*, are raised, and all the others depressed; then a wire is introduced between the open sheds, to make the loops of the pile, as before; which is then beaten up, and the course is completed. At the tenth opening of the sheds, the wire is bound in by raising and depressing the headles, as stated in the first operation, and the weaving proceeds in the order described.

In conclusion, the patentee states, that "this is a series of operations of the loom, as arranged in the drawings, which, if carried out as stated, will produce the work I call my improved fabric; but it must be understood, that I do not confine myself to this precise series of movements, as different weavers may think proper to arrange the warps, and connect them to the several headles in another order, to effect the same work. It is therefore to be understood, that I have only pointed out one mode of arrangement by which my object may be effected; intending to avail myself of any

other arrangement of the warps, and movements of the headles, by which the combined operations of weaving velvet or pile, on one or both sides of the fabric, with cloth-work, twist-work, gauze or satin, and elastic strands, may be effected, which is the novel production of elastic fabric that I claim to have invented."

Figs. 4, 5, and 6, are front views of the headles *m*, *a*, and *b*, shewing the manner in which it is preferred to work the gauze thread from the beam E, by cords extending from the eyes of the warps to the headle *m*, passed through the loops of the headles *a*, and *b*, which is commonly called the "dupe or half leaf," and is well understood by weavers.—[*Inrolled in the Petty Bag Office, May,* 1845.]

Specification drawn by Messrs. Newton and Son.

To HENRY ATKINS, *of the town and county of the town of Nottingham, lace manufacturer, for certain improvements in the manufacture of net lace.*—[Sealed 5th November, 1844.]

THESE improvements in the manufacture of net lace consist, firstly,—in effecting a new intervention of threads, to produce the fabric of lace upon a single-lap and press principle; which improved fabric is to be made upon a warp-machine, by means of peculiar movements given to the guide-bars and point-bars; two courses being required to effect the intervention, and to perfect the forms of the meshes; secondly,—in peculiar movements given to the machinery for the production of holing and fancy-work in the fabric; and, thirdly,—in a new method of folding the lace ready for the dealer.

In Plate I., fig. 1, represents, upon a magnified scale, a portion of the first-mentioned net lace; the distinct threads being shewn by outline and shading, in order to explain their contortions and interventions, which are effected without any alterations of the original warp-machinery, simply by a peculiar cut of wheels, shewn at figs. 2, and 3. Fig. 4, is a sectional elevation of an ordinary warp-machine, taken transversely through the machine, near one end; and fig. 5, is a horizontal view of the same, taken about the level of the

derstood by reference to figs. 2, 3, and 4; fig. 2, being a plan view, shewing the edge of the projections *f*, and also the holes *e*, *e*; fig. 3, a vertical section; and fig. 4, a view representing the cylinder as rolled out flat. *g*, *g*, is a circular casing, placed within the cylinder *d*, and furnished with a slot *h*, the whole of its length. Upon the upper part of this casing *g*, is a flange, which serves as a cover to the casing *a*, and at bottom it is secured to that casing by a nut and screw *i*. *j*, is a rod, carrying at its upper end a handle *j**, and at its lower end a finger *k*, which passes through the slot *h*, and works between the inclined planes *f*, and *f**. In the interior of the casing *g*, the end of a wooden handle *l*, (by which the labourer holds the apparatus,) is fitted. The end of this handle has an opening up the middle, to allow of the free up and down movement of the finger *k*. The rod *j*, as will be seen on inspecting the drawing, passes through this handle, but has no connection therewith. For convenience sake, it is proposed to supply seed or grain to the tube *b*, through a tube of calico or other suitable material, which may be filled before commencing to sow, and suspended by a band or strap, passed round the neck of the labourer.

The action of the improved apparatus is as follows:—The seed, descending by its own gravity down the tube *b*, falls on to the flange or ring at the bottom of the cylinder *d*, and into the holes *e*; the finger *k*, is then drawn up, by means of the handle *j**, and coming in contact with the inclined edge of one of the projections *f**, will move the cylinder *d*, part of a revolution, equal to the distance between the centre of one hole *e*, and the centre of the next adjoining hole; the descent of the finger *k*, will cause a similar movement of the cylinder, by its coming in contact with one of the lower inclines *f*.

It will now be readily understood, that a repetition of such movements will bring the holes *e*, filled with grain, &c., in succession over the pipe *c*, down which the grain will fall in small quantities, to be deposited in the ground. *m*, is a brush fixed in the casing *a*, to prevent the fall of more grain down the pipe *c*, than is contained in the openings *e*. The quantity of grain or seed to be deposited by the apparatus may be regulated by the capacity of the openings or holes *e*.

Figs. 5, and 6, represent another plan whereby the deposit of seed in the ground is effected at requisite intervals; fig. 5, being a view with the side-plate of the implement removed, and fig. 6, a vertical section of the same, taken in the line 1, 2, of fig. 5. It consists of a framing (the upper part of which is formed into a handle for holding the instrument), covered by two side-plates *a*, *a*, between which a ring of metal *b*, having an opening *c*, is fixed. Within this ring is another ring *d*, pierced with circular holes *e*, at equal distances from each other. One edge of the periphery of this ring *d*, is formed into a ratchet, the teeth of which are equal in length to the distance between the centres of the holes *e*; *f*, is a catch, taking into the ratchet-wheel; a portion of the ring *b*, being cut away, to leave the ratchet-wheel exposed to the action of the catch. To the upper end of the catch a rod is jointed, which forms a handle for working the apparatus; and the catch is kept at its lowest position by the spring *g*. *h*, is a stationary brush, for preventing the fall of more grain or seed than is deposited in the holes *e*; and *i*, is the shoot or channel down which the seed drops on to the ground. The seed or grain is supplied to the centre of the pierced ring *d*, through a pipe *l*, cast or soldered on one of the side-plates. The action of the apparatus is as follows:—The catch *f*, taking into a tooth of the ring *d*, will, when drawn up to its full extent, cause the ring *d*, to make part of a revolution, and bring one of the holes *e*, filled with seed or grain, over the opening *c*, when it will discharge its contents down the channel *i*. By letting go the catch *f*, the spring *g*, will force it down to its original position, where it will take into the next tooth of the ratchet-wheel, by the pressure of the spring *j*: *k*, is a spring, for preventing the return of the ratchet.

The third arrangement of seed-dropper, shewn at figs. 7, and 8, is very similar to the one last described; the only difference being, that instead of a ring *d*, pierced with holes, a disc of metal, or other substance, is employed, in which recesses or cups are sunk, for holding a certain portion of seed or grain. The brush, in this instance, is situated above the disc *d*, as shewn at *h*, and an opening is made in the ring *b*, at *b**, to allow of the seed falling into the cups *e*. The parts

of this instrument coinciding in other respects with that last described, any further explanation will be unnecessary, as similar letters of reference denote similar parts in these figures.

The patentee claims, with respect to the first described implement, the application of a revolving ring, plate, or flange, pierced with holes, for regulating the quantity of seed to be dropped at intervals from a hand-dropping machine; and also the application of a cylinder (attached to, or in connection with, the revolving plate), having slanting projections or grooves, in which a finger or pin is made to work, and cause the revolution of the said ring or flange, for the purpose above described. With respect to the second described implement, he claims the peculiar construction of revolving ring, shewn in the drawing, whereby the seed or grain is delivered at intervals on to the ground. With respect to the third described implement, he claims a revolving disc, in the periphery of which cups or recesses are formed for holding grain or seed, when such disc is applied to hand-droppers. And lastly, with respect to the above described implements, he claims the application of a flexible tube or bag, for supplying the same with grain or seed.—[*Inrolled in the Petty Bag Office, June,* 1845.]

Specification drawn by Messrs. Newton and Son.

To William Newton, *of the Office for Patents,* 66, *Chancery-lane, in the county of Middlesex, civil engineer, for an invention of certain improvements in treating and preparing oil or fatty matters,—being a communication.*—[Sealed 12th September, 1844.]

These improvements in treating and preparing oily or fatty matters relate more particularly to the treatment and preparation of palm oil, and are intended to render the same more applicable to the various purposes for which it may be employed. The invention may be divided into two heads; the first being an improved method of treating palm oil, for the purpose of separating the liquid from the solid parts, or the oleine from the stearine and margarine; and the second, an improved method of bleaching solid fatty matters.

The essential feature of novelty of the first head of the in-

vention is the separation of the liquid from the solid constituents of the palm oil, without employing the process of saponification, as is ordinarily the case. The manner in which the operations are carried on is described by the inventor as follows:—

"The principle of this invention or discovery, and the mode of proceeding to effect the separation of the liquid from the solid portions of the oil, is founded upon a fact, that has hitherto escaped the observation of manufacturers, and has never, to my knowledge, been usefully and advantageously applied to the arts. This hitherto undiscovered fact is, that the liquid and solid constituents of the palm oil exist naturally in a state of chemical separation, in the palm oil of commerce, although their particles are in mechanical contiguity, and that therefore nothing else is requisite to effect their complete separation but a purely mechanical process, unassisted by any ingredients which would effect a chemical change in the oily or fatty matters, as is the case when saponification takes place.

"The process, which forms the subject of the present invention, consists in causing the solid fats to crystallize, by first heating and then gradually cooling the raw material; then submitting it to pressure, to remove a certain portion of the oleine; after which it is again heated and cooled, so as to cause it to crystallize a second time, when a fresh quantity of oleine may be expressed or removed, by a second pressure. By this means the separation of the solid and liquid fat is effected, without resorting to the process of saponification, and is conducted as follows:—I take the raw palm oil, as it is imported from Africa, (or, if thought more advantageous, palm oil, previously bleached, may be taken), and a large quantity of the palm oil, whether bleached or unbleached, is put into iron or other vessels, and heated to about 212° Fahr., at which temperature it is maintained for about one hour; after which it is run off into wooden or other convenient vessels, where it is allowed to cool very slowly, and to remain until it begins to crystallize. The congealed mass is then to be packed in cold woollen cloths, in quantities varying from 16 to 30 lbs. each bundle, according to the capacity or

of the press. Hydraulic pressure is preferred, and the mass of congealed fatty matters is, in the first instance, submitted to a light or gentle pressure, whereby about one-third part of the mass is made to run off in a liquid state, and which will be found to be nearly pure oleine. The other two-thirds of the mass remain in a solid state between the woollen cloths.

"The liquid obtained, as above mentioned, from this first pressure of the materials, when cold, is pure, or nearly pure, oleine; but as palm oil is generally considered to contain about 69 per cent. of oleine, and 31 per cent. of stearine and margarine, or solid matter, it follows that one-half of the former is yet contained in the solid cakes or masses that have been submitted to the first pressure above mentioned.

"In order to facilitate the further separation of the remaining portion of the oleine from the stearine, the cakes of fatty matters must be again heated in a boiler or vessel, to about 212° Fahr., for from three to four hours, after which it is again run off into a wooden or other convenient vessel, where it is left to cool slowly, and crystallize a second time.

"The fatty matters are then again packed in small parcels of from 16 to 30 lbs. weight each, in woollen cloths; and each parcel is to be place in a horse-hair bag or sack, and between pressing-plates, when the fatty matters are submitted to a second pressure, with a powerful hydraulic press. For this second pressing operation, the woollen cloths, the horse-hair bags, and the pressing-plates, are to be warmed before packing the mass in bundles in the press.

"It will be found, that a small portion of the solid fats will run off, during the second or warm pressing operation, with the liquid oleine. Such being the case, the oleine or liquid matter, thus obtained, is added to a mass of fresh palm oil that has not yet been operated upon, and is about to undergo the first pressing operation. The cakes that remain in the cloths, after the second or warm pressing operation, will be found to consist of the solid constituents or parts of palm oil, namely, stearine and margarine. It has been found, that from 100 lbs. weight of the raw palm oil of commerce, 30 per cent., or nearly so, of stearine may be obtained, by my process, and about 68 per cent. of oleine. This latter substance,

when obtained by the above process, is not diminished in value, as it would be if the old process of saponification were employed; but will be found to be quite as good, and equally applicable to the purpose of making soap as the raw palm oil itself; as it undergoes no chemical action.

"If the oleine is to be converted into white soap, it must, of course, be bleached, which may be done in the usual way. The cakes of stearine that remain in the woollen cloths, after the second and warm-pressing operation, are then to be bleached, if the palm oil, from which they were obtained, has not been previously operated upon for that purpose.

"The operation of bleaching the stearine or solid fat, and which forms the second part of the invention, is not conducted in the usual way, by means of chlorine, manganese, or sulphur, but upon an entirely different, and what I conceive to be, a new plan. The cakes of stearine, obtained as above, are placed in a tub or vessel, and melted; the temperature being maintained at about 212° Fahr. When the mass has been reduced to a perfectly liquid state, it is to be run out into a trough or conduit, which is kept supplied with a running stream of clear cold water, in the proportion of about two parts of water to one of stearine, so that the latter always meets a quantity of water about double its own bulk; and by this means it becomes almost instantaneously solidified, and converted into minute particles or crystals. The water, carrying the stearine and margarine in this state with it, is run into a vessel, from whence the stearic and margaric crystals are removed, and exposed to the action of the air, and the light of the sun, whereby they become perfectly white in a very short time. The bleached solid fats, or stearine and margarine, are then to be re-melted in a bath of water, that is to say, they are placed in a vessel containing water, and are mixed therewith. The water is then heated by means of steam-pipes, or in any other convenient manner, and a small quantity of sulphuric acid is added, in the proportion of about 2 lbs., by weight, of acid to 100 lbs., by weight, of the stearine or fatty matter, for the purpose of clearing the latter from all particles of iron, or any other foreign or extraneous

matters, which might have gone over or become mixed therewith, during the different processes of boiling. After the mass has been cleansed in this manner, it is removed to another vessel, where it is again melted in water, with the addition of the white of five eggs to every 100 lbs. weight of stearine or fatty matter. The whole must boil for some time (about one hour), and be kept well stirred; after which it should be left to itself, for the purpose of allowing all the dirt and other impurities to settle at the bottom of the vessel. The stearine and margarine is then run off into moulds, and, when solid, will be found to be a fine white crystallized fat, consisting of stearine and margarine, ready for use.

"This improved process of bleaching may also be employed for bleaching wax, or other materials of which candles may be manufactured; and is also applicable to bleaching stearine, obtained from other substances than palm oil.

"If it is proposed to use the stearine for the manufacture of candles, it will be found desirable to prepare the candlewicks in the following manner, as their burning will be thereby very much improved. Dissolve 1 part of boracic acid (well ground) in 24 parts of alcohol, or of dilute sulphuric acid (but alcohol is preferable); let the wicks that are intended to be used remain in this liquid for twelve hours; after which press them gently, to remove any superfluous liquor, and use the remaining portion of the liquor for another operation."

In conclusion, the patentee states, that "although I have described and explained a means or method of effecting the separation of the fatty matters, which has been found fully to answer, yet I do not mean or intend to confine myself strictly to the precise order, time, and temperature, above set forth, as these points may be considerably varied, according to the state of the weather, and other circumstances, without departing from the nature of the invention; and I also wish it to be distinctly understood, that I lay no claim to the broad principle of submitting palm oil to pressure, for the purpose of effecting the separation of the stearine, and other solid fats, from the oleine or liquid fats, when saponification is employed;

the object of this invention being to effect the crystallization of the solid fats, and ultimately their separation from the liquid fats, without resorting to the process of saponification.

"That which I consider to be new in the above described process, and therefore wish to claim as the invention to be secured to me by the hereinbefore in part recited letters patent, is: Firstly,—operating upon raw palm oil (either bleached or unbleached), in the manner above set forth, so as to cause the solid fats to crystallize, without employing the process of saponification. I claim as new, in the above described process, crystallizing the solid fats, by alternately heating and gradually cooling the whole mass, from which the whole of the liquid particles are then removed by pressure. Secondly,—I claim the method above set forth, of bleaching stearine, or other matters, of which candles are or may be manufactured, whether such stearine or other matters is or are applied to the manufacture of candles, or to other purposes to which it or they may be applicable."—[*Inrolled in the Petty Bag Office, March,* 1845.]

Specification drawn by Messrs. Newton and Son.

To ALEXANDER WRIGHT, *of Hale's-place, South Lambeth, in the county of Surrey, engineer, for certain improved apparatus for measuring gas, water, and other fluids, and in the means of manufacturing the same.*—[Sealed 17th October, 1844.]

THIS invention consists, principally, in a novel arrangement and construction of meter, whereby liquids and gaseous fluids may be measured in a steady and uniform manner.

By this construction of meter, a more certain method of ascertaining the volume of fluids passed through it is obtained; also a great saving in the cost of manufacturing the meter is effected; and the simplicity of the machine prevents the liability of its derangement.

The several figures in Plate II., shew different views of the improved meter. Fig. 1, is a vertical section, taken through nearly the middle of the meter; fig. 2, is a front view, with part of the casing removed; fig. 3, is a vertical section, taken in

the line A, B, fig. 1; fig. 4, is a view of the under part or bottom of the meter, shewing the passages for the gas; and fig. 5, is a horizontal section, taken a little above the cranks in the vertical shaft.

This meter consists of a metal casing, intersected by two diaphragms, thereby forming three distinct measuring-chambers A, B, and C; in each of which the gas is alternately received and discharged through the rotatory action of a peculiarly constructed valve D, placed in one of the chambers. *a, a,* is the outer casing of the meter, which is preferred to be made of galvanized iron; *b,* is the inlet-pipe, and *c,* the outlet-pipe; *d, d, e, e,* are conical plates, connected by a ring of leather *f, f,* or other flexible material, to the casing *a, a,* thus forming diaphragms, which are supported and guided, in a horizontal direction, by an arm *g,* shewn in fig. 2. A vertical crank-shaft *h, h,* mounted in the middle of the meter, has two cranks in it, forming an angle of 60° with each other. This vertical shaft is put in motion by the connecting-rods *i, i,* attached to the respective diaphragms *d,* and *e,* (see figs. 3, and 5,). The lower end of this shaft bears upon a bridge *k,* over the valve D, and, by the shaft revolving, a rotary motion is communicated to the valve, by means of the driver *l.* The upper end of this shaft passes through a stuffing-box, and, being connected to the counting apparatus, gives motion thereto.

Figs. 6, 7, 8, 9, 10, and 11, represent different views of the valve D, detached, and upon an enlarged scale. This valve, it will be seen, consists of two parts; the upper part is shewn in plan, at fig. 9, and in sections, taken at right angles to each other, in figs. 10, and 11. This part of the valve revolves with the crank-shaft *h,* by the means hereafter described; and the lower part (shewn in plan at fig. 6, in vertical section at fig. 7, and in horizontal section at fig. 8,) is soldered or otherwise fastened securely to the bottom of the meter case, where it communicates with the inlet pipe *b**, the exit pipe *c**, and by means of the channels *m,* and *n,* (see figs. 3, and 4,) with the side chambers B, and C, as well as with the centre chamber A. The lower portion of the valve D, is formed of three tubes, *b**, *c**, and *p,* set concentrically; they are con-

nected together, and made fast by solder to the face-plate shewn in fig. 6. The outer tube *p*, is divided vertically into three compartments p^1, p^2, p^3, and a portion of this tube at the compartment p^1, is cut away, in order to leave free ingress and egress for the gas, to and from the chamber A. The gas, upon entering the meter at the top, by the inlet *b*, passes down in the direction of the arrows, under the meter, into the centre tube *b**, of the valve D, and, rising up that tube, enters by an opening into the upper part of the valve D, fig. 1. The gas then descends by the opening *q*, which is then over the compartment p^1, thereby allowing the gas to flow into the chamber A, where it will force back the diaphragms *d*, and *e*, into the position shewn at fig. 3, and cause the crank-shaft to make a portion of a rotation; and by means of the driver *l*, in the lower end of this shaft, coming against a forked stud *r*, projecting from the top of the valve D, the upper portion or cover of that valve will be moved such a distance round, as to bring the opening *q*, over the division or compartment p^2. In this position of the valve, the gas will be allowed to flow down the division p^2, and thence, proceeding along the channel *m*, (see figs. 3, and 4,) will fill the chamber B, and, in so doing, will drive inward the diaphragm *d*, to its extended position. By the rod *i*, being forced inwards, the crank-shaft *h*, will be made to rotate, and cause the other rod *i*, to drive outward the diaphragm *e*, into the chamber C; and, as the valve revolves, the opening *q*, in the top of the valve, will come over the division p^3, which is in communication with the chamber C, and thus that chamber will commence filling. But in order to permit this, the gas in the centre chamber A, must be driven out, which is effected by the cranks on the vertical shaft *h*, bringing the two diaphragms nearly together, at which time the opening *t*, in the top of the valve D, comes over the division p^1, whereby a vent is made for the escape of the gas from the chamber A, which now ascends the opening in the division p^1, passes up the opening *t*, and through the concentric tube, or annular space *c**, which is in communication with the exit pipe *c*. The gas having been forced from the chamber A, and the chamber B, being now filled, the opening *t*, will have come over the division p^2, and the gas in the chamber B, will flow through the opening *t*, and the an-

nular space c^*, to the outlet pipe *c*, as before described; and the gas in the chamber C, as the openings in the valve D, come round, is allowed to escape, in the same manner, through the passages p^3, *t*, and *c*. A plan of the upper part of the valve, and position of its openings at fig. 2, is shewn by dots in fig. 6. Upon the top of the crank-shaft *h*, a pinion *u*, (see fig. 1,) is mounted, which gives motion to a wheel *v*, and thence to the series of wheels and pinions of the counting apparatus, whereby the revolutions of the crank-shaft are recorded upon the index. There are screw-plugs *w*, *w*, placed at the bottom of the meter, for the purpose of drawing off any vapour that may enter the meter with the gas, and be condensed therein.

Figs. 12, and 13, represent two views of a pattern or template, to be employed for marking (with greater accuracy) the lines whereto the partitions of the chambers in the wheels of wet gas-meters are to be attached;—fig. 12, represents a flat strip of metal, with a series of angular slits *x*, made therein, corresponding to the parts of the partitions, which are intended to be soldered to the interior of the periphery of a meter wheel, which must be formed into a ring, as shewn at fig. 13, and upon it the hoop of the meter wheel, to be divided, is placed, as shewn by the dotted circle. This hoop is held firmly against the stops *y*, on the template, and a scriber is passed along the various slits, to mark the divisions on the inside of the hoop of the meter wheel.

The patentee claims, Firstly,—the construction of three measuring-chambers, formed by the intervention of two moveable diaphragms. Secondly,—the direct action of the arms or rods which connect the rotatory crank with the diaphragms, and without the intervention of stuffing-boxes. Thirdly,—the peculiar construction of valve above described, with reference to figs. 6, 7, 8, 9, 10, and 11, and its combination with the passages and the pipes. Fourthly,—the use of galvanized iron, for the construction of the casing and other parts of a gas-meter, where necessary. And, Fifthly,—the apparatus described for marking the divisions upon the hoop or periphery of the wheel or drum of a wet gas-meter.—[*Inrolled in the Petty Bag Office, April,* 1845.]

Specification drawn by Messrs. Newton and Son.

To Webster Flockton, *of the Spa-road, Bermondsey, in the county of Surrey, turpentine distiller, for an invention of certain improvements in machinery or apparatus for sweeping or cleansing streets, roads, or ways,—being a communication.*—[Sealed 12th September, 1844.]

These improvements consist in a certain novel construction and arrangement of machinery, by which a series of brooms or brushes, connected to a carriage, may be made to move horizontally over the street, road, or way, in a circular direction, as the carriage advances, for the purpose of sweeping the mud, dirt, and other matters, into a ridge or heap, by the side of the carriage, from whence it is to be afterwards taken up, by hand labour, into mud-carts, or other suitable receptacles.

In Plate III., fig. 1, represents a side elevation of the machine; fig. 2, is a horizontal view of the same; and fig. 3, is a section, taken longitudinally through the machine, in the direction of fig. 1. A rectangular frame *a, a, a,* is formed, consisting of two longitudinal rails, each being strengthened by a truss above, and connected by several transverse rails. By this frame, which constitutes a carriage, the whole of the machinery is supported. To the fore part of the frame or carriage the axletree *b,* is attached by a vertical pin, allowing it to turn for locking, as usual; and this axletree carries the front running-wheels.

At the back part of the carriage the frame is extended in breadth, for the purpose of supporting the axle or shaft *c,* on which the hinder running-wheels are mounted. Two circular concentric rings *d, d,* are securely fixed to the under part of the frame, by lugs and bolts *e, e, e*; the rings being coincident as to their level, and forming a circular rail-road for conducting the series of revolving brushes *f, f, f.*

A horizontal drum or wheel *g,* called the cylindrical box, and which carries the sweeping apparatus, is suspended below the rings *d, d,* by the following means:—Into the upper side of the drum *g,* four studs *h, h,* are inserted, and made fast; each of which studs carries two anti-friction rollers *i, i,* in-

tended to run upon the upper surface of the circular railways, and thereby support the suspended drum, and conduct it as it travels round with its sweeping apparatus. Upon the axle or shaft *c*, of the hinder running-wheels, a bevil toothed wheel *k*, is made fast, which takes into another bevil toothed wheel *l*, on the end of a longitudinal shaft *m*. The reverse end of this shaft *m*, has also affixed to it a bevil toothed wheel *n*, taking into a similar wheel *o*, fixed upon the lower end of a vertical stud *p*, turning freely in the central transverse bar of the frame *a*. This vertical stud *p*, is, by a clutch-box *q*, connected to the axle of the horizontal drum-wheel *g*. The brooms *f, f, f*, of which eight are proposed to be employed, are long and thin, and are bent into a segmental form, as best suiting the purpose: they may be made of any of the ordinary materials used for sweeping. One of these brooms, with its appendages, is shewn detached at fig. 4. The brooms are severally affixed to the outer end of a lever *r*, the inner end of which lever is connected by a joint to the hub or nave of the drum-wheel, and a long slot or opening in the periphery of the drum, through which the lever passes, allows the lever to rise and fall freely. The extended positions of the brooms are preserved by rods *s, s*, attached to their outer edge, and linked to the periphery of the drum.

The manner in which the improved sweeping-machine performs its functions is as follows:—The carriage being drawn forward by animal or manual labour, runs upon the four wheels in any course in which it is directed. The hinder running-wheels of the carriage are connected to the axle *c*, by two spring clutch-boxes *t, t*; the one clutch of each box being fastened to the nave of each running-wheel, and the other clutch of each box to the axle *c*. These boxes are kept locked together by means of internal spiral springs, which force their ratchet teeth into close connection, and lock the wheels to the axle. Hence, it will be perceived, that as the carriage moves onward, the rotation of the hind-wheels, in rolling over the ground, will, through the clutches *t, t*, cause the shaft *c*, to rotate, and, in so doing, give rotary motion to the toothed wheels *k, l*, shaft *m*, and mitre wheels *n, o*, by which

means, through the clutch q, on the stud p, the drum-wheel g, will be driven round; its supporting studs h, h, passing between the rings d, d; and their friction-rollers i, i, running round upon the railways or face of the rings. By these means the series of curved brooms f, f, f, will be made to travel in a circular course, and sweep the mud and other matters into a heap or ridge, on the left-hand side of the advancing carriage; and should any obstruction present itself to the progress of the brooms, the jointed connections of their levers r, to the drum g, will allow them to rise and pass over any slight impediment. In some cases it is proposed to guard the brushes, by placing before them wire scrapers, as shewn at v, v, v, in the figures. These may be readily attached to, or detached from, the fronts of the brooms, by any convenient modes of fastening; or, in place of these guards, a series of scrapers may be employed, to cut up or remove any hard substances. When the brooms, as they revolve, approach the hinder part of the carriage, they are to be lifted up off the ground. This is effected by an additional railway of a segmental form, affixed, in an inclined position, to the under part of the carriage, as shewn at w, w. Arms are attached to the upper part of each curved broom, having an anti-friction roller u, upon each of them; and, as the brooms come round, these rollers u, mounting up the inclined segmental rail w, will cause the brooms successively to be raised from the ground, and be let down again when they arrive at the part where the sweeping is to commence.

It will sometimes be found desirable to apply a series of cutters, rakes, or scrapers, in the front part of the carriage, as at x, having spiral springs upon the upright guide-rods of their frame, for the purpose of enabling the scrapers to rise, should they come in contact with any considerable resisting substance. It may also be desirable, at times, to water the ground before the brooms, for the purpose of moistening the materials, allaying the dust, or liquefying the mud. This may be done by placing a water-tank, as at y, on the back part of the carriage, and leading a leather pipe or hose therefrom to a trough z, in front; by which means a constant flow of water may be made to jet from a series of holes in

the trough, which will effectually moisten the dirt, allay the dust, and liquefy the mud, when necessary.

The patentee claims, Firstly,—the general arrangement of mechanical parts shewn in the drawings. Secondly,—the cylindrical box, drum, or wheel, in which the brooms are carried; and the means by which they are made to revolve and to rise in case of obstruction. Thirdly,—the long curved form of the brooms, of whatever materials they are made, and either with or without wire-guards or scrapers. Fourthly,—the circular railways affixed to the carriage, by which the cylindrical box, carrying the brooms, is supported and conducted round, as the carriage progresses. And, Fifthly,—the segmental inclined railway, and the appendages to the brooms, whereby the brooms are successively raised out of operation at the hinder part of the machine, and brought into operation again at the part required.

The patentee, in concluding, remarks, that a hood or covering may be attached to, and placed over, the machine, to confine the dust which may rise in dry weather; and that the machine may be applied to clear the rails of railways from dirt and snow, by attaching it in front of the locomotive engine.—[*Inrolled in the Petty Bag Office, March,* 1845.]

Specification drawn by Messrs. Newton and Son.

To CHRISTOPHER PHIPPS, *of River, near Dover, in the county of Kent, paper-manufacturer, for an improvement or improvements in the manufacturing of paper, and in marking writing and other papers, or in the machinery employed for those purposes,—being partly a communication.*—[Sealed 21st June, 1844.]

THE improvement in the manufacturing of paper (which is the patentee's own invention) relates to the sizing of the long sheets made by Fourdrinier and similar machines.

It is usual in paper-mills to employ a drying-machine in conjunction with the machine by which the paper is made, so that the operations of making and drying are carried on together; the paper being perfectly dry when it leaves the

drying-machine. The number of heated drying cylinders, over which the paper generally passes, varies from two to five, according to their size; but as the sizing is preferred to be effected, in the improved method, when the paper is in a partially dried and heated state, the paper, in this case, as it comes from the machine, is caused to pass over one heated cylinder only; which cylinder is from two to three feet in diameter, and is heated by steam to a degree of heat little less than that of boiling water. The sheet of paper proceeds from the drying-cylinder to a cylindrical reel, and the size is applied, by means of an elastic or other roller or rollers, to the outer surface of the paper, as it is being wound upon the reel; then, as the reel revolves, and the paper is wound around it, the sized surface of the paper imparts a portion of its size to the unsized surface, which is brought in contact with it; and the paper being allowed to remain for a sufficient time upon the reel, becomes perfectly sized throughout; after which, it is unwound, and passed onwards to the drying-machine.

In order that the size may be uniformly absorbed, without the necessity of removing the paper from the paper-making machine, four reels, to receive the sized paper, are mounted in a frame, which is capable of turning upon a horizontal axis, when it is requisite to remove the reel that has become full of paper, and bring forward another into the proper position for receiving the paper; and as the time required for making and sizing the quantity of paper which one reel can hold, will be quite sufficient for passing the same quantity (after it has been sized) through the drying-machine, the sized paper will thus be allowed to remain upon each of the loaded reels somewhat more than double the time occupied in filling a reel.

After describing this part of the invention, the patentee states, that this improvement consists in "the application of size to writing and other papers, by an elastic or other roller or rollers, whilst such paper is being wound round a cylindrical reel, in the manner hereinbefore mentioned or described, and for the purpose of sizing such paper in manner aforesaid."

The improvement in marking writing and other papers, (which was communicated to the patentee by a foreigner) is to be used as a substitute for the ordinary water-mark; it

consists in impressing letters, figures, or other devices, upon sheets of paper that have not received the water-mark.

The letters, figures, or other devices, are cut out of either paper, thin sheets of metal, or other suitable material; and in order that such letters, &c., may produce impressions upon paper similar to the water-mark, they are made in the following manner:—Suppose, for instance, that the word "patent" is to be impressed upon sheets of paper, then the letters constituting this word are made thus, PATENT; the black lines, which form these letters, representing the forms of the letters that are to be cut out of paper, &c. These forms of letters are glued or otherwise fastened upon a sheet of paper or other suitable material; a second sheet of paper is then laid over the letters, and the edges of the two sheets being glued together, the whole forms what the patentee terms a "stamp." The mode of employing the stamp is as follows:—Upon two or three sheets of metal, such as are commonly used for glazing paper, one or more sheets of the paper to be marked is, or are, laid; on these the stamp is placed; then one or more sheets of the paper to be marked; and, lastly, two or three sheets of metal. The pack, thus formed, is passed through a rolling-press, similar to those used for glazing paper, and the desired marks are thus given to the paper.

The patentee states, that this part of the invention consists in "the stamp, formed by placing letters, figures, or other devices, between two sheets, as hereinbefore described, and the use or application thereof in manner and for the purposes hereinbefore mentioned."—[*Inrolled in the Petty Bag Office, December,* 1844.]

To SIR GEORGE STEUART MACKENZIE, *of Coul, in the county of Ross, Bart., for an improvement or improvements in the manufacture of paper, more particularly for the purposes of writing, and copying writings, and machinery for effecting the same; also the manufacture of a fluid or fluids, to be used with the improved paper, in the manner of ink.*—[Sealed 26th September, 1844.]

THE objects of this invention are, firstly,—to substitute for the common black and blue inks a transparent, and, as much

as practicable, a colorless and innocuous fluid, which, being used with suitably prepared paper, will produce either black or blue characters; and, secondly,—to produce a black ink, which, when written with on paper or other material, suitably prepared, will flow readily from the pen, and be indelible, and from which copies may be taken, if required, on copying paper, prepared for the purpose.

In the first place, a dry powder is prepared, consisting of 1st, gall-nuts in their natural state, or salts prepared from them, or from other substances containing tannin, by treating galls, or such other substances, with water, common spirits, alcohol, ether, vinegar, pyroligneous acid, or other means. 2nd, anhydrous ferrocyanide of potassium. 3rd, carbonate of lime, or anhydrous carbonate of soda. 4th, rice flour. The proportions of these articles, and the number of them employed, admit of variation, according to the varying qualities of the gall-nuts. The proportions that have been found suitable for producing dark writing are, three parts, by weight, of powder of gall-nuts, one part anhydrous ferrocyanide of potassium, one part carbonate of lime, and three parts rice flour; for blue writing, one part anhydrous ferrocyanide of potassium, and six or seven parts rice flour: the blue tint may be varied, by the addition of a small quantity of gall-nut powder. These powders are pressed into the paper, after it has been sized, and before it is finished; in the case of hand-made paper, the powder is pressed in by hand, assisted by a brush to remove the superfluous portions, or by a small machine; and it is applied to machine-made paper by the machinery hereafter described. Parchment is prepared in the same manner, by hand, to be written on with the black indelible ink.

The clear fluid used as ink with the prepared paper is made of per-muriate of iron, diluted with a large proportion of water,—other per-salts may be used.

The black indelible ink may be prepared in two ways, either by rubbing down Indian ink in a pretty strong solution of per-muriate of iron in water, or by making a stiff paste of the finest lamp-black (prepared from bones) with strong mucilage of gum arabic, and diluting this paste with a strong so-

lution of per-muriate of iron in water,—one measure of per-muriate of iron to seven of water. Copies may be taken, on prepared copying paper, of anything which has been written with this ink.

The machinery or apparatus for applying the powder to machine-made paper consists of, 1st, rollers for drawing in the paper. 2nd, a box, having a narrow bottom of fine wire-cloth, and capable of being shaken, so that a small quantity of powder may escape from it; or, instead of the box, a revolving metal cylinder, finely perforated, may be used. 3rd, a rather open brush, having a lateral motion, to spread the powder over the paper as it passes. 4th, a close and rather hard brush, with a lateral motion, for rubbing the powder into the paper. 5th, a revolving brush, moving in an opposite direction to the paper, for sweeping off the superfluous powder. 6th, a roller to take up the paper, and to turn the under side up, in order that it may be treated in the same manner as the other side. Any other suitable machinery may be used for applying the powder.

The patentee claims, Firstly,—the impregnation of paper of all kinds, parchment, and all substances for writing on, with dry substances, simple or compounded, in various proportions, to adapt them for producing dark or blue characters or traces, by means of a transparent and nearly colorless fluid, as above described; and also the preparation of the said colorless fluid. Secondly,—the preparation of the black indelible ink, to be written with on paper and other substances for writing on, prepared as above described. Thirdly,—taking copies of writing, done with the said indelible ink, on copying paper, prepared in the same manner with dry powders.—[*Inrolled in the Inrolment Office, March,* 1845.]

To John Wheeley, *of Stafford, manufacturer of iron, for improvements in the manufacture of iron spoons.*—[Sealed 18th December, 1844.]

This invention consists in preparing plates or strips of iron for making spoons, by forming them with different degrees of thickness throughout their length, so that the handles may

be cut, side by side, from the thickest portion of the iron, and the part for the bowl of the spoons may be cut from the thinner portion.

In Plate III., fig. 1, is an edge view, and fig. 2, a plan view of a strip of iron, prepared according to this invention. The iron is rolled into plates or strips, of a sufficient width for making the bowl of a spoon, and with certain parts thicker than others: thus, from *a*, to *b*, is a thin portion, suitable for making the bowl; from *b*, to *c*, the iron is thicker, suitable for making two handles, side by side; and from *c*, to *d*, is a thin portion, for making another bowl: The spoons are cut out of the plate or strip in the manner indicated by the dotted lines in fig. 2, and are finished in the ordinary way.

By the adoption of this invention, less labour will be required in the finishing process; and there will be, comparatively, little waste in "scrap."

The patentee claims,—preparing iron in the form herein described, and applying it to the manufacture of iron spoons.
[*Inrolled in the Inrolment Office, June*, 1845.]

To Arthur Wall, *late of Bisterne-place, but now of India-row, East India-road, Poplar, in the county of Middlesex, surgeon, for certain improvements in the manufacture of steel, copper, and other metals.*—[Sealed 18th December, 1844.]

This invention consists in the use of a current of electricity for improving the manufacture of steel, copper, tin, zinc, and their compounds.

The mode of introducing this improvement in the manufacture of steel is as follows :—The bars of iron to be converted into steel are placed in rows or ranges, one above the other, in the converting chamber, with their ends supported by blocks, as shewn at figs. 1, and 2, in Plate III.; fig. 1, being a plan view of the bottom range of bars; and fig. 2, an end view of three ranges of bars. *a, a, b, b, c, c,* are the bars; and *d, d, e, e, f, f,* the supporting blocks, which are intended to convey the electricity from the end of one bar to the end of

the next, throughout the series. The spaces between the adjoining blocks *d, d,* are filled with refractory fire-clay, level with the upper surface of the blocks; then a stratum of fire-clay, half an inch thick, is laid on the upper surface of the blocks, and upon it the second range of blocks *e, e,* is placed; and so on until the required number of ranges have been placed one above the other. The spaces between the bars *a, a,* are filled with a mixture of six parts of finely pulverized charcoal or coke, and two or three parts of pulverized chalk; but the spaces between the upper ranges of bars are filled with pulverized charcoal or coke alone.

The ranges are connected together by strips of metal *g, g,* and at each extremity of the ranges a pole-bar *h,* and trial-bar *i,* are placed. Two wires pass from the pole-bars to a "Smee's" or other galvanic or voltaic battery; and when the bars of metal have become of a red heat in the furnace, the wires are connected with the poles of the battery, and the electric fluid is thus transmitted through the entire series of bars. The transmission of electricity through the bars is carried on for twelve or fourteen hours, or for a longer period, according to circumstances; it being continued until the trial-bars exhibit the proper indications of a perfect conversion.

The battery employed in the above process should contain about 30,000 inches of surface for the conversion of 12 tons of bar metal: the best mode of arranging this quantity of surface is to make each pair of plates to contain an acting surface of 300 inches, under the dimensions for each plate of 10 inches by 5 inches.

The patentee likewise proposes to subject cast steel to the action of electricity; and, for this purpose, he adopts the method pursued by him for the electrization of bars of cast iron, as described in the specification of his former patent, dated November 18, 1843.*

Copper, tin, zinc, and their compounds, are subjected to a current of electricity, whilst in a fluid state, and also whilst in the act of solidifying; the mode of proceeding being the same as that described with reference to cast iron in the spe-

* See London Journal, Vol. XXVI., p. 426.

cification above referred to, except that the conducting wire must be of platinum.

The patentee claims, as his invention, the improvement in the manufacture of steel, copper, and other metals, and their compounds, by subjecting them, while in a molten state, and in the progress of solidification, to the influence of electricity, as above described.—[*Inrolled in the Inrolment Office, June,* 1845.]

To HENRY BEWLEY, *of Lower Sackville-street, in the city of Dublin, apothecary and chemist, and* GEORGE OWEN, *of the same place, chemist, for improvements in the mode of confining corks, or substitutes for corks, in bottles and other vessels, whether made of glass, earthen, or stone ware, containing liquids charged or not charged with gas.*— [Sealed 20th July, 1844.]

THIS invention consists,—firstly, in confining corks, or their substitutes, in the necks of bottles and other vessels, by cementing or otherwise fastening thereon caps of metal, earthenware, or wood, furnished with wire clasps that catch under the rim of the neck; which mode of securing corks renders it unnecessary that they should be so long as those ordinarily used, or inserted so tightly into the necks of the bottles. By this means, also, the present laborious processes of corking and uncorking will be wholly, or to a great extent, superseded, and new corks can be substituted for worn-out ones with little or no disturbance of the contents of the bottles. Secondly, the invention consists in confining corks, of the usual length and form, in bottles, by means of caps or rings (having suitable wire clasps), which are merely placed upon the corks, without being cemented or otherwise fastened thereto.

In Plate I., fig. 1, represents the upper part of a bottle, with the cork retained in its place by means of the first part of this invention; and fig. 2, is a vertical section of the cork. *a*, is the cork; *b*, the metal cap, which is cemented upon it; and *c, c*, are two wire clasps, shaped somewhat like a stirrup, the ends of which are bent, and pass through the cap into the

cork. These clasps being drawn downwards, in opposition to the elastic action of the cork, and caused to catch under the rim of the bottle, will keep the cork in its place. When the cork is required to be withdrawn, it should be pressed upon, in order that the clasps may be released from beneath the rim; and then the clasps being turned up, are used as handles for pulling the cork out of the bottle; thereby dispensing with the employment of a corkscrew. The short cork used may be made tapering, as shewn, or of any other form that may be preferred; and the cap may be either circular, octagonal, or of any other suitable shape.

Fig. 3, exhibits a similar mode of retaining the cork, in which the cap is formed, with a lug or ear at each side, with two openings in it for the ends of the wire clasps to pass through.

Sometimes the cap is made with two curled wing pieces to receive the ends of the wire clasps, as represented at fig. 4: the wings being either turned downwards or upwards, as may be preferred.

Fig 5, shews another mode of confining the cork. *d*, is a piece of wood, metal, earthenware, or any other suitable material, placed upon the cork *a*; and *e*, is a metal ring, that rests on the rim or shoulder of the piece *d*, and keeps the cork in the bottle by means of the wire clasps *c*, *c*.

For very common purposes, the patentees use a plain cap of wood, cemented to the cork.

Fig. 6, is a perspective view of another instrument for confining the cork. *e*, is a metal ring, that encircles the top of the cork; and *c*, *c*, are two wire clasps, the ends of which pass through the ring into the cork.

If preferred, the clasps *c*, *c*, instead of being stirrup-shaped, may be made of the form shewn at fig. 7, consisting simply of a piece of wire, slightly curved, with the end turned up to catch under the rim of the bottle.

The corks of bottles, which contain valuable liquors, are secured by the cap merely pressing thereon, without being cemented or otherwise attached to the cork; and in the centre of the cap a hole is made to receive sealing-wax, with which the portion of the cap around the hole is also to be

covered, and the seal of the owner impressed upon it, so as to prevent the withdrawal of the cork (which will require the aid of a corkscrew) without discovery.

The patentees claim, as their invention, Firstly,—the confining of corks, or substitutes for corks, in bottles and other vessels, by cementing or otherwise making the same fast to caps of metal, earthenware, or wood, having wire clasps attached thereto, which catch under the rim or ring of the neck of the bottle, as before described; such corks, or substitutes for corks, being shortened, and shaped to suit this mode of confining the same, as before explained. Secondly,—the confining of corks, or substitutes for corks, in bottles and other vessels, whether such corks, or substitutes for corks, are of the ordinary or any other length, by the super-position of caps of metal, or of earthenware, having clasps of wire attached thereto, as aforesaid, and having occasionally open spaces left in the centre of such caps, to allow of the same, and the portion of the caps immediately around them, being covered with wax, and stamped with the seal of the owner. Thirdly,—the confining of corks, or substitutes for corks, by clasps, attached to rings, as before described.—[*Inrolled in the Inrolment Office, January*, 1845.]

To Louis Antoine Ritterbandt, *of Gerard-street, Soho, in the county of Middlesex, Doctor of Medicine, for certain improvements in preventing and removing incrustation in steam-boilers and steam-generators.*—[Sealed 2nd December, 1844.]

The object of this invention is to prevent and remove incrustation in steam boilers. In commencing his specification, the patentee states, that the incrustation of steam-boilers, wherein fresh water is used, arises chiefly from the heat causing the lime (which exists in the water in the form of a soluble bicarbonate), to be converted into an insoluble carbonate of lime, the particles of which, as they fall towards the bottom, carry down with them other insoluble matters that may be floating in the water; and as regards boilers wherein salt or sea water is used, the incrustation is generally promoted by

the carbonate of lime set free by the heat, which, as it floats in the water, previous to subsiding, forms a nucleus for the gathering of other matter, and disposes the saline compounds, such as the sulphate of magnesia, chloride of sodium, &c., to crystallize, and precipitate, much sooner than they otherwise would. This invention is designed, in the first case, to prevent the formation of carbonate of lime, or to convert it, when formed, into a soluble salt; and in the latter case, to retard the formation of the saline crystals, and thereby also to retard the precipitation of other floating matters which would produce incrustation. To effect these objects, the patentee introduces into the water in the boiler, or into the supply tank, a quantity of muriate, acetate, or nitrate of ammonia, or any other ammoniacal salt, the acid of which, uniting with lime as a base, will form a perfectly soluble salt of lime, which will not be precipitated by heat, and neither incrust the boiler, nor contribute to its incrustation, by promoting the crystallization or precipitation of other matters.

The quantity of ammoniacal salt to be employed will depend upon the amount of lime contained in the water in the form of bicarbonate; the patentee describes the following mode of ascertaining the amount:—"Take a gallon or any other measure of the water to be examined, and evaporate it slowly in an open vessel. Collect the solid matter left at the bottom of the vessel, and weigh it carefully. Then add to it, in a glass vessel, a mixture of equal parts of muriatic acid and distilled or rain water, and let it remain during fifteen minutes. Next filter through white filtering or blotting paper, or strain through clean linen or calico. Collect the solid matter left in the filter, and dry it. The difference between its weight now and before, will give the amount of carbonate of lime dissolved in the muriatic acid: thus, if a gallon of water gives ten grains of solid matter, and, after digesting with muriatic acid, there are only six grains left, the gallon contains four grains of carbonate of lime."

If muriate of ammonia be employed to prevent incrustation, the quantity added to the water should equal the quantity of lime contained therein, or rather exceed it; as, for instance, fifty-four parts of the ammoniacal salt to fifty parts of car-

bonate of lime. When acetate of ammonia is used, the proportions must be about forty parts of a saturated solution thereof (prepared by adding carbonate of ammonia to acetic or pyroligneous acid, or to distilled vinegar, until no more is dissolved) to fifteen parts of carbonate of lime. If nitrate of ammonia be employed, the proportions must be about eighty parts of the crystals to fifty parts of carbonate of lime. In every case, the amount of water evaporated in a given time must be taken into account, as in proportion to the water evaporated will be the carbonate of lime set free, and the quantity of ammoniacal salt required.

The action of the muriate of ammonia (which is preferred by the patentee, on account of its cheapness) is partly chemical, and partly mechanical. It is chemical, inasmuch as, after the introduction of the salt into the water, a double decomposition takes place; the muriatic acid combines, by elective affinity, with the lime, to form muriate of lime, while the carbonic acid passes to the ammonia, and forms carbonate of ammonia; the muriate of lime remains in a state of solution, and the carbonate of ammonia, volatilizing under the influence of the heat, passes off along with the steam. This decomposition, however, goes on slowly and gradually. When the ammoniacal salt is added to the water in considerable quantities at a time, part of it remains in the state of muriate of ammonia until the introduction of a fresh supply of water; it will, therefore, be found advantageous to add the salt in considerable quantities at a time, as one supply will then be sufficient for several days, or even weeks. The mechanical action of the muriate of ammonia (as also of the acetate, nitrate, or other salt of ammonia) consists in increasing the density of the water, and thus assisting to retain in suspension any foreign matter which would otherwise sink to the bottom, and there form a solid incrustation.

To free boilers from old incrustation, muriate of ammonia, or any other ammoniacal salt (the acid of which, with lime as a base, will form a soluble compound), is used, but in much larger quantities, say, double, or even treble, the proportion above mentioned. And when the old incrustation does not readily yield to these means, the patentee introduces, once a

week, into the water in the boiler or supply tank, a quantity of muriatic or nitric acid, in the proportion of about one quart to one hundred gallons of water; or acetic acid, in the proportion of one gallon to one hundred gallons of water; or common vinegar, in the proportion of two gallons to one hundred gallons of water.

The patentee claims, Firstly,—the application of ammoniacal salts, in the manner before described; to prevent and remove incrustation in steam boilers and steam generators. Secondly,—the use of ammoniacal salts, in conjunction with muriatic, acetic, or nitric acid, for the purpose of removing old incrustation, in the manner above described.—[*Inrolled in the Inrolment Office, May,* 1845.]

To William Charlton Forster, *of Bartholomew-close, in the city of London, for an invention of a material, or compound of material, not hitherto so used, for preventing damp rising in walls, and for freeing walls from damp, which material, or compound of material, can be applied to other purposes.*—[Sealed 20th September, 1841.]

This material for preventing damp from rising in walls, and for freeing walls from damp, applicable also to other purposes hereafter mentioned, is a compound of the common clays or argillaceous earths, now in general use for making bottles and other vessels to contain liquids. Of this compound there are two kinds, the one generally known by the name of stoneware, naturally impervious to water and damp; and the other of a coarser and more porous texture, and which requires glazing to render it impervious to water. This compound is to be formed into slabs, and placed at the foundation of walls and buildings, by which means the damp or moisture will be prevented from rising from the earth to the wall or building above; they are also to be placed on the face of walls or buildings, and will prevent damp or moisture passing sideways to the wall or building, from the adjacent or surrounding earth; they are also to be employed to line walls or buildings, to prevent the appearance of wet or damp; they may be also

used for making reservoirs, tanks, or cisterns, to contain water, and for paving, and for the copings of buildings; but the patentee does not claim the exclusive use of the said material, or compound of material, for the last mentioned purposes. The manner of carrying out the invention is as follows:—The slabs of earthenware or stone-ware are made flat, and of about nine inches by eleven, sixteen or twenty inches square, and about one inch in thickness, with groove and tongue-joints, or with overlapping edges, so as to fit closely to each other, and thereby give a better surface for the cement to hold the edges of the slabs together, and to prevent effectually any moisture from passing between the joints. In using these slabs to prevent the damp rising to walls or buildings from the earth, the patentee carries up the foundation wall a few inches above the natural level of the ground, or surface of earth, which is intended to remain around it, and then puts a layer of these slabs over a bed of mortar or cement, laid on the top of the wall, so that the slabs may form an even surface of material, impervious to any damp or moisture; the wall or building is then continued to the required height, and, when so constructed, will not be subject to any damp arising from the ground. For the purpose of preventing any damp or moisture passing sideways to the parts of walls or buildings, below the surface of the earth, a layer of these slabs, cemented at the joints, is fixed by nails or similar fastenings against the outer surface of the wall in contact with the earth. In order to free walls, in houses or buildings already constructed, from damp, a layer of bricks, or a layer of whatever material of which the walls or buildings are made, is taken out from the foundation wall just above the surface of earth around, and a layer or layers of these slabs are cemented into the wall, so as to present an impervious obstacle to the damp or moisture rising from the foundation or earth beneath: the result will be, that the damp or moisture, that was in the walls or buildings above the layer of slabs, will gradually evaporate, and the wall will become perfectly dry.

Should it be required to free the lower part of the foundation walls from damp, it would be requisite to put the layer of slabs near the bottom of the foundation wall, and likewise

remove any earth or ground that may rest against it, in order to place the slabs on the outer surface of the wall, where-ever it may be liable to receive moisture. By this means, the slabs placed outside; being impervious to wet, the wall or walls of the building will gradually dry by the heat employed in the lower offices.

The patentee, in conclusion, says, "I do not lay claim to the invention of the said material, or compound of material; my invention, in regard thereto, being confined to the formation of the said material, or compound of material, into slabs, and to the use and application thereof, for and to the purposes aforesaid."—[*Inrolled in the Inrolment Office, March,* 1842.]

To JAMES COOPER, *of St. John-street, Clerkenwell, provision merchant, for vessels of peculiar construction, and an apparatus for the purpose of preserving various articles of provision for the use of families.*—[Sealed 5th December, 1843.]

THIS invention relates, firstly, to the construction of vessels for steaming fruit and other articles of provision; and secondly, to apparatus for closing jars or other vessels used for preserving fruit and other provisions.

In Plate III., fig. 1, represents, in sectional elevation, a vessel A, intended to receive a jar in which fruit or other provisions are to be preserved. This vessel is intended to be placed over the opening in the boiler of a common kitchen range, from which steam will rise and surround the jar containing the fruit. In order to allow of various sized jars being used, the patentee constructs his improved vessel A, of two or more parts *a*, *b*, *c*, by which means it is capable of enlargement. The bottom part *a*, of the vessel is furnished with brackets to hold the jar *d*, which is placed thereon, by removing the cover *c*, at top. Steam rising from the boiler of the kitchen range will now circulate round the jar *d*, and partially cook the fruit or other provision contained therein; and, when this operation has been carried on a sufficient time, the cover *c*, must be taken off, and the jar removed to be corked down.

To facilitate the operation of corking, the patentee proposes to use a screw-press, which will quickly force the bung or stopper into the mouth of the jar.

Figs. 2, and 3, represent a press in which the corks are to be squeezed, previous to being used; fig. 2, being a side view, and fig. 3, a plan, with the moveable jar removed. The cork or stopper, when pressed into the mouth of the jar, is secured in its place by a screw-clamp (shewn in plan and elevation at figs. 4, and 5,), to prevent the expulsion of the cork during the operation of steaming, to which the jar of fruit is to be again submitted: this clamp is retained upon the jar until the contents have cooled down.

The patentee remarks that the process of preserving fruit, &c., by the application of steam, having been long practised, he lays no claim thereto, nor will any further description be necessary; his invention being confined to the construction and application of vessels, suitably arranged, in order to be used with the boilers of kitchen ranges; and to apparatus for stopping and retaining the stoppers, when preserving fruits or other provisions, in jars and other suitable vessels.

Fig. 6, represents, in elevation, an apparatus for drawing the corks from the jars. *e*, is a corkscrew, which is first screwed by hand into the cork; a framing *f*, having at its lower end a ring *g*, is then placed over the jar; *h*, is a screw which passes through the upper part of the framing, and is furnished at top with a handle, and at bottom is attached to a crossbar *i*, which is guided by the side frames *f*. At the under side of this bar *i*, is a holder *k*, which is brought down to the handle of the corkscrew *e*, and made to take hold of that handle, and when drawn up, by a reverse direction being given to the screw *h*, will draw with it the corkscrew, and pull the cork out of the neck of the jar.

The patentee claims, Firstly,—the constructing of the vessels A, in such a manner that they may be applied to an opening in a boiler of a kitchen range, when preserving provisions in jars or other vessels by steam. And, Secondly,—the mode of constructing apparatus for stopping jars and other vessels, when preserving provisions therein, and securing such stoppers, when the contents of such jars or vessels are corked; and

also the corkscrew for withdrawing the cork or stopper.—[*Inrolled in the Inrolment Office, February*, 1844.]

To Elizabeth Cottam, *of Winsley-street, Oxford-street, for improvements in heating what are called Italian irons.*—[Sealed July 30th, 1844.]

The novelty of this invention consists in preserving a uniform heat to Italian irons, in place of the irregular and inconvenient heating which is obtained from the use of hot irons, as at present practised. For this purpose, water, or other fluid, is employed as the heating medium, and its application will be readily seen by reference to Plate II. Fig. 1, represents, in vertical section, a vessel *a*, from which three Italian irons *b, c, d,* protrude; and fig. 2, is a plan view, taken in the line 1, 2, of fig. 1. Into this vessel *a*, hot water is poured, and the heat is kept up by a spirit lamp, placed underneath the vessel. If required, larger or smaller irons may be attached to the vessel, by employing the screw-fastening shewn in the drawing.

Another plan of heating Italian irons, intended principally for laundries, where several persons are simultaneously employed in ironing, is shewn at fig. 3; the irons, in this case, are attached to a tube, which may be heated by steam or hot water constantly circulating through it, supplied from, and returned to, a boiler, in the way ordinarily employed for such a purpose.

The patentee claims the mode of heating Italian irons, as herein described.—[*Inrolled in the Inrolment Office, January*, 1845.]

To James Wrigglesworth, *of Bedford-street, Strand, in the county of Middlesex, chemist, for an improvement or improvements in steel pens.*—[Sealed 2d December, 1844.]

This invention consists in giving any desired degree of elasticity and flexibility to steel pens, combined with any requisite degree of thickness at the points or nibs, by the employment of chemical agents.

The pens are first made in the usual way, of one thickness throughout; the points or nibs, and any other parts desired to be protected, are then dipped in varnish, drying oil, liquid fat, or any other matter or mixture capable of resisting the action of the chemical agents that are to be employed for reducing or shaping the unprotected parts of the pens; when thus prepared, the pens are immersed to any required depth, and for any suitable time, in nitrous acid (diluted to any specific gravity, and kept at a temperature corresponding to the specific gravity), or in any other chemical substance capable of eating away, biting out, or reducing the metal to the desired extent; after which, the varnish, fatty matter, or other protecting material, is removed from the pens, by plunging them into hot water, or into an alkaline mixture.

The patentee proposes to give the title of the "Eureka pen" to pens which have undergone the above treatment.

He claims, as his invention, the rendering of steel pens elastic or flexible, by means of chemical agents, applied to certain parts thereof, as above described.—[*Inrolled in the Inrolment Office, June,* 1845.]

REPORTS OF AMERICAN PATENTS.

From the "Journal of the Franklin Institute,"

EDITED BY DR. THOMAS P. JONES.

To Charles *and* George Escol Sellers, *Cincinnati, Ohio, for improvements in machinery for manufacturing lead pipes.*

In manufacturing lead pipes by this process, the metal from which it is to be formed is fused, and poured into a receiver of cast-iron, or other metal of great strength, which receiver is heated by means of a suitable furnace, so as to preserve the metal in a fluid state. The lower part of the receiver contains a die, having an opening through it of such size as to adapt it to the forming of the outside of the pipe, and a case, or mandrel, to determine its size, or calibre, within. It also incloses the apparatus which is employed for the purpose of cooling the pipe as it leaves the core, and also of keeping the temperature of the core below that of melted lead, by which means the patentees effectually prevent the combining of the lead with the surface of the core, which takes place when lead is in a fused state, and is subjected to heavy pressure. The fused lead is to be forced out by means of

a ram, or plunger, made to fit the cylindrical cavity containing the lead, the said plunger being brought down by means of an hydrostatic press.

Claim:—"We do hereby declare, that we do not claim any of the parts of the said machinery when taken separately, with the exception of those hereinafter particularly pointed out; nor do we claim the use of the hydrostatic press, for applying the force required in the formation of the pipe; nor the use of conical dies for forming its exterior, or of a mandrel for forming its interior; nor the bridge by which the said mandrel is sustained, these having been long since used, and being described in the specifications of patents obtained in England and elsewhere, and having, therefore, become public property; nor do we claim the manufacturing, or forming, of lead pipe from lead kept in a molten state whilst it is kept in the cylindrical cavity, which we have called the receiver, and also when it passes the bridge, and arrives at the conical die, and the part of the mandrel which said die surrounds, this having been before done by us, and by others; but what we do claim as our invention, is the employment of a tubular core, or mandrel, divided longitudinally into chambers, through which heated water, air, or steam, is to be passed, in the manner described, and for the purpose of preserving the said core at a temperature somewhat below that of melted lead; by which device the lead is effectually prevented from adhering to the mandrel. We claim the manner of forming the packing of the ram, by attaching to its end the piece of wrought-iron, rendered thin at its lower edge by forming the face of the said piece concave, for the purpose above set forth."—[The purpose here alluded to is keeping the piston tight, and preventing the escape of the melted lead around the edges of the ram, or piston.] "We claim the combination and arrangement of the parts constituting the water-chamber, consisting of the tube, the bed-piece, and the conical die; the supply of water thereto being given, and governed substantially as described."

To Caleb Merritt, *Baltimore, Maryland, for an improved machine for pressing hats and bonnets.*

The shaft on which the hat-block is placed, has its bearings in a segment-piece jointed to the frame, for the purpose of giving to the block any desired inclination, which is effected by a pinion that takes into cogs on the periphery of the segment-piece. The hat-block is provided with a mitre cog-wheel, which gears into another mitre-wheel on the pin that forms the centre of motion of the segment-piece, that the wheels may continue in gear through the whole extent of the vibration of the segment-piece with the hat-block. The last-named mitre-wheel gears with another cog-wheel on the shaft of a ratchet-wheel, the band of

which is operated by a series of levers in connection with a rock-shaft, actuated by the shaft or rod that carries the pressing-iron, and which is worked by the operator—the end opposite the handle being connected by means of a universal joint, and a slide with a gate or frame attached to a long arm projecting from the rocking-shaft. By this arrangement, the pressing-iron being midway between the handle part of the shaft and its connection with the gate, the pressing of the iron on to the hat by the operator communicates motion to the whole combination above described, and causes the block to turn with the hat on it.

Claim:—"What I claim as my invention, is the combination of the shaft, which carries the pressing-iron, with the gate, by means of the slide and universal joint, as described; and these, thus combined, I claim in combination with the rock-shaft, which communicates motion to the shaft of the hat-block, by the action given to the shaft which carries the pressing-iron. I also claim the segment-piece which carries the shaft of the hat-block, and which is shifted by the pinion, in combination with the mitre-wheels, &c., for the purpose and in the manner described."

To Oliver Halstead, *New York City, for a machine for giving exercise to dyspeptics and other invalids.*

The patentee says,—"The nature of my invention consists in giving to a seat, upon which the patient is placed, an exercise similar to that given to the rider on a horse, with this difference, that, in the absence of all effort, on the part of the patient, to retain his seat upon the chair of exercise (which absence of effort is not obtained on horse-back), he may relax the abdominal muscles, which is indispensable, in order to stimulate the muscular coat of the stomach, and, at the same time, restore the peristaltic motion of the bowels, so that both secure their healthy action."

The seat may be attached, by means of a slide, to one end of a working-beam, vibrated by means of a crank, excentric, or cam, actuated by any first mover; or a seat may be attached, by the same means, to a car, the axle of one of the sets of wheels being cranked to vibrate the beam; and two of these cars may be attached to the opposite ends of a sweep, in the manner of what are well known as flying horses. There are various modifications described and represented.

Claim:—"What I claim as my invention, is the giving of an undulating or jolting motion to a chair, by means substantially as herein described, for the purpose of curative treatment of dyspeptics, and other invalids, and for healthful exercise. I do not mean to confine myself to the precise form of construction of the individual parts, but vary them as I may have occasion, without departing from the general principles of action herein set forth, to wit, the giving of an undulating or jolting motion to a chair

in contradistinction to a rocking or oscillating movement of the same, of which several examples of such variations are represented and specified."

To LUCIEN E. HICKS, *Middletown, Connecticut, for an improvement in the mode of regulating the burning of alcohol, or other inflammable liquids, when used for vapour bathing, and other purposes.*

THIS apparatus consists of a circular vessel, the cover of which, within the rim, is curved upwards, and then down with a short cylindrical tube of one-third its diameter, rising from the middle, and having small apertures to admit the inflammable matter from the pan, or reservoir, to be ignited therein, and a turning disc-valve to regulate the intensity of the combustion. A perforated ring, for admitting air, is placed on the top of this pan, and above the ring is placed the vessel containing the medicated materials to be evaporated, and over this a cover, with a small pipe and holes, to conduct off the vapour. The person who is to receive the vapour is placed on a stool above this apparatus, and properly surrounded, as is well known to all who have taken vapour baths.

Claim:—"What I claim as my improvement, is the method of regulating the burning of alcohol, or other inflammable liquids, by means of the application of apertures and valves, as above set forth and described, when applied to vapour bathing, or other purposes, separately, and also in combination with a chamber, or reservoir, for holding the inflammable liquid that is to be conducted and burned at the apertures, and gradually supplying the same therewith during the process of combustion, constructed and operating as above described, so as to prevent ignition."

To GEORGE E. WARING, *Stamford, Fairfield county, Connecticut, for an improvement in the portable furnace.*

THE patentee says,—"My portable furnace I make of cast-iron, and in its general construction it resembles such as have been heretofore made. My improvement consists in combining with the body of the furnace either a rotary or a stationary rim, so formed as, in conjunction with the shape given to the upper edge of the body of the furnace, to constitute a flue-space, the opening into which is through what I call the collar part of the rim; although this rim may be made stationary, I prefer, in all cases, to make it rotate, and shall describe it as being capable of doing so. By means of this device the heated air from the burning fuel is made to pass around the above-named flue space before it is conducted off, and the heat is thereby much economized."

Claim:—"What I claim as new in this furnace, is the forming of a flue space around its upper edge, by a projection from the

body of the furnace, in conjunction with the rim, or in any other manner that is substantially the same; and this I claim, whether the rim be made to rotate in the manner described, or whether it be permanently fixed with the opening towards the front of the furnace."

To JOHN WOOLLEY, *Springfield, Hampden county, Massachusetts, for improvements in stoves for cooking, and heating, and ventilating buildings.*

A DOUBLE case surrounds a stove of ordinary construction, the inner part of the double case being so much larger than the stove as to form an oven with shelves, through which the pipe of the stove passes, and from which it extends to the top of the house; and there is a hole from the oven into the pipe, for conducting off the fumes, vapour, &c., from the cooking. The door to the oven is double, as well as the rest of the case which surrounds the oven; and the space between the inner and outer cases, and the double door, are provided with holes at the bottom, to admit air from the room, which, after being heated, passes into a space between the smoke-pipe and an outer pipe which surrounds the smoke-pipe, and which also extends above the roof of the house, where a cap covers both of them for the purpose of increasing the draught. This outer pipe is provided with branch pipes for conducting the heated air into different apartments, and above these branch pipes there is a box and valves for preventing or permitting the escape of heated air from the space in the case.

Claim :—"What I claim as my invention, is the combination of the case and stove, in the manner described, the pipe of the stove passing up through the centre of the case, and having a hole therein, for the purpose set forth. I also claim carrying the two pipes out above the roof together, and covering them both with a cap, constructed, combined, and arranged in the manner and for the purpose set forth. Lastly, I claim, in combination with the above, the valve box and valves near the top of the house, for closing the outer pipes."

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 426, Vol. XXVI.)

MR. CLEGG corroborated the statement of Mr. Samuda, as to the difference of effect obtained, and also as to the superiority of the present valve with the composition joints, which, for all practical purposes, was quite tight, over the valvular cord, which was

never tight. The piston of Pinkus' apparatus was, in fact, only a disc without packing, not fitting close to the inside of the main; and it was clear he never expected to make his apparatus anything like air-tight, or he would not have specified his intention to use a pipe 40 inches in diameter.

Mr. Gibbons said, that the atmospheric system had been at work between Kingstown and Dalkey, since the month of October 1843, frequently running as many as thirty-five trains per day; and since the 30th of March 1844, the line had been opened regularly for the public service, a train leaving every half-hour. The arrangements had given perfect satisfaction; the valve was found to be sufficiently tight for all practical purposes, and it was practicable to start the train in one minute after the engine commenced working. As resident engineer of the line, he was satisfied of the applicability of the plan to all such positions as that under consideration.

Mr. Cowper thought, that the inefficiency of the valvular rope arose, in a great degree, from the convex form of the rope, when it was laid in the groove, not according with the interior form of the other portions of the main; whereas the present valve was so constructed, that the lower iron plate was concave on the underside, and, when in its place, the circular form of the pipe was perfect, and the leather packing of the piston was enabled to fit close all round against the sides of the tube.

Mr. Samuda said, that his brother's object, in bringing the paper before the Institution, was that, while he fulfilled the usual promise made on his election, he wished to subject the system to open discussion, by explaining clearly all that had been done, and thus to ascertain whether, in the opinion of the profession, any progress had been made in facilitating the construction or working of railways, by the introduction of the atmospheric system. He thought, that any discussion as to the novelty of any part of the present system, was foreign to the views of the Institution, and would be misplaced, if introduced at the meetings; he would, therefore, only observe that Mr. Clegg took up the invention at the point where Medhurst had left off; and the plan now introduced, had remedied certain defects which existed in former plans. Messrs. Clegg and Samuda had, in the course of their experiments, introduced many mechanical details, which had suggested themselves as necessary practical improvements, and the results had proved very satisfactory.

He then recapitulated succinctly the principal points treated of in the paper, and in reviewing the circumstances of the experiments, he stated, that after obtaining a certain amount of success upon a short piece of railway, at the works of Messrs. Samuda, they leased a length of half-a-mile of railway at Wormwood Scrubbs, where a tube of 9 inches diameter was laid down, on a radient of 1 in 120; the vacuum obtained at first, was between i inches and 18 inches of mercury; but it had improved gra-

dually, in consequence of the composition being better imbedded in the groove by constant use, and the valve becoming more air-tight, from its closing more perfectly. That line was worked for nearly 2½ years; during twelve months of that time, the public were admitted regularly for two days each week, in order to afford every facility for criticism.

The attention of the Dublin and Kingstown Railway Company was directed towards it, and it was determined to try it between Kingstown and Dalkey. They required a gross load of 26 tons, to be conveyed at the rate of 30 miles per hour. The average result obtained was, that a gross load of 50 tons had been propelled, and a maximum speed of 50 miles per hour had, at times, been obtained. The main was 15 inches diameter, on an average gradient of 1 in 115; the engine employed was 100 H.P., working an air-pump of 67 inches diameter, with which a vacuum of 25 inches of mercury had been obtained, although the usual working point was between 15 and 16 inches, at which point the power absorbed was about 78 H.P.

A parallel had been attempted to be drawn between the system by rope traction, and the atmospheric plan. It must be observed, that the conditions were different. In both the rope system and with locomotives, the weight of the tractive power required to be moved with the train; and there was a consequent expenditure of power, independent of the consideration of the friction of the rope against the pullies, in the one case, and the slip of the driving wheels, in the other case. An engine and tender, on the London and Birmingham Railway, weighed about 20 tons; if that weight of 20 tons could be suppressed, it would enable an additional amount of traffic to be carried, which might be represented by 15 tons of profitable merchandise added to each train, which, on that railway, running 12 to 14 trains per day, would give a gross sum of £150,000 per annum.

A great saving would result from the use of coal instead of coke, under the boilers, and from the expansive system and condensation of the steam, instead of wastefully using high-pressure steam; for however the locomotive boilers and engines may have been improved, they were still far from economical in the consumption of fuel, as compared to other applications of steam.

The reduced cost of maintenance of way, and the diminished destruction of the rails, must not be overlooked. It was notorious, that the beating action of the driving wheels of locomotives was most injurious to the rails; and that, on many lines, they required to be changed within a few years after being laid down.

It had been shown, that every attempt to increase the speed of locomotives was attended with such extra cost, as had materially checked the trials; and also, that a certain amount c danger to the passengers had been the result. He was of opinio that with the atmospheric system such would not be the cas He contended, that the security with which the curves on tl

Dalkey line were traversed, was evidence of the safety of the system. Upon the atmospheric system, it was shown that, with an air-pump of ten times the area of the main, and the air-pump bucket travelling at the rate of 3 miles per hour, a velocity of 30 miles per hour could be given to the piston of the main, and that if double the power was exerted, double the speed must be produced, subject to a certain deduction for the leakage, which was, however, diminished in proportion as less time was afforded for it, by the shorter period allowed for the passage of the train.

Mr. Horne inquired whether the continuous valve on the Dalkey line, exhibited any symptoms of injury from the friction of the projecting arm of the piston by which it was raised, and also, whether the leather hinge was not likely to be worn out speedily.

Mr. Gibbons replied, that the valve was raised by wheels, which acted against the lower plate, and thus there was not any friction against the leather. The leather hinge did not exhibit any appearance of cracking, nor did he anticipate such an effect, as the motion to which it was subjected, was not sufficient to produce any injurious effect.

Major-General Pasley said, that until he had examined the working of the system on the Dalkey line, he scarcely entered fully into all the considerations dependent on it, and he recommended the members to inspect it personally, previously to the next meeting, in order to be enabled to discuss the system usefully.

Mr. Horne inquired whether, in practice, it had been found, that any injurious effects resulted from the twisting motion, to which the continuous valve was subjected, during the passage of the train. He conceived, that the alternate bending of the leather, and of the iron plates of the valve, by the upward action of the opening rollers, and the downward pressure of the atmosphere and the sealing apparatus, would in time destroy the valve.

Mr. Samuda explained, that the valve was opened gradually by four rollers upon the travelling frame; they were so arranged that a length of 15 feet of the valve was lifted, and that only at an angle of about 38°. The connecting arm was bent in such a manner as to require a vertical opening of only about $1\frac{1}{4}$ inch, which in a length of 15 feet would not cause any injurious strain upon the leather, either at the outer edge, or at the hinge, and if the number of times that the valve was lifted in a day, was compared with the number of beats made by pump-clacks, under ordinary circumstances, and it was recollected how long the latter lasted, there would appear but little probability of the speedy destruction of the valve leather.

In answer to questions from Mr. Horne and Mr. May, Mr. Samuda said, that he had tried a wider surface for the valve to fall upon, without the mixture of wax and tallow on the joint, and had not been able to establish any effective vacuum in a pipe of only 100 feet long. The mixture was composed of bees'-wax,

and the refuse of tallow, after the stearine had been extracted, for making composition candles; this had succeeded perfectly in all weathers, and neither heat, rain, nor frost, had been found to affect the soundness of the joint.

The cost of the atmospheric apparatus, including the main pipe, and the steam engines complete, was computed at £5000 per mile. It must be borne in mind, that lighter rails could be used, because there was not any beat upon them, as with locomotive engines; there would also be a saving in forming the earth works, as steeper gradients would be permitted: a further economy would be made in suppressing the expensive stock of locomotives, and he conceived, that on almost all existing railways, a single line would suffice for the traffic. The stations for the engines were supposed to be 3 miles or 3½ miles apart, which distance, he thought, would afford the greatest facility for working the line. He believed, that there were very few locomotives capable of drawing a load of 40 tons, at a velocity of 40 miles per hour, up a gradient of 1 in 115, although the power of many of these locomotives, if calculated by the same divisor as he had used for the Dalkey engine (66,000 lbs.), would be found fully equal to 100 H.P.

Mr. Bergin confirmed Mr. Samuda's statement. The Dalkey engine had a cylinder of 34¼ inches diameter and 5 feet 6 inches stroke. The pressure of steam in the boiler was 4 lbs. above the atmosphere; it was cut off at ¼th or ⅕th of the stroke, working the engine by expansion and condensing; and it made about 22½ strokes per minute. The consumption of fuel was about 34 cwt. per day, when doing ordinary work, which was, conveying 22 trains each way in 10 hours, and including 10 cwt. of fuel used in getting up the steam in the morning. Cardiff coal of bituminous quality was generally employed. The railway from Kingstown to Dalkey was very tortuous, some of the curves having a radius of 570 feet, and only ⅛th of a mile was straight; the gradients were also heavy, the greatest being 1 in 100, where the pipe was laid, and the average 1 in 115. The Dublin and Kingstown railway was quite straight and almost a dead level, yet the cost of transit on the latter, by locomotive engines, was 11*d.* per train per mile, while on the former the cost was 8¼*d.*, taking, in both cases, the same items of expenditure.

He had carefully observed the working of the trains upon the curves, when descending the gradients, which they did by their own gravity, and he found a certain amount of retardation upon every sharp curve and under every bridge; in the covered part of the line, when the wind set in a certain direction, it sufficed to prevent the carriages from arriving in the station at Kingstown.

He coincided in the opinion, of a single line being generally sufficient for the traffic, but he thought, that there should be a pair of engines of half the power, and two air-pumps, at each

station, in order to avoid the risk of stoppage, from accidental derangement of the moving power. He did not apprehend, that an atmospheric railway would be more liable than an ordinary line, to be stopped for repair; if a valve required to be changed, it could be done with great rapidity; he had seen an entire pipe changed in half an hour.

He had commenced an investigation upon the temperature of the air, when entering and leaving the air-pump, but it required very careful examination, to enable positive results to be stated, and his time had been too much occupied to permit his devoting himself to it: however, he might state, that he found a certain absorption of power, consequent upon the increase of temperature and density of the air on leaving the pump. When a vacuum of 28 inches was formed, the temperature of the air on being expelled from the pump was upwards of 200° Fahrt. Poisson's formula for calculating the temperature under similar circumstances, would have given 343° Fahrt. There did not appear to be any sensible augmentation of the temperature of the air in the main, in front of the piston.

In answer to questions from Mr. Herapath, Mr. Samuda explained, that the connection between the piston bar and the leading carriage of the train was by a bent rod, with an universal joint and stops, so contrived, as to enable the piston to adapt itself to any qualities of the rails, or of the main, without greatly increasing the friction against the sides.

When the system was tried upon the Railway at Wormwood Scrubbs, there were such inequalities of height between the several parts of the line, that this mode of connexion had been severely tried, and it had proved quite satisfactory.

It must be observed, that the connecting link passed through the valve in an oblique direction and became vertical, above and below; that the rollers for opening the valve, were narrower than the continuous slit, and that they were carried by a frame apart from and behind the piston.

In answer to questions from the President, Mr. Samuda explained, that the end of the main was closed by an equilibrium valve, which enabled the vacuum to be formed, before the piston entered the section of main under exhaustion. The velocity attained depended upon the relative areas of the main and of the air-pump, and also upon the amount of vacuum obtained. Taking all circumstances into consideration, the most economical working vacuum was about 16 inches of mercury, which could be increased or diminished, as occasion required. The pressure of the atmosphere being constant, the speed would be equal with all loads, provided the pressure sufficed to start the train.

Mr. Slate said, it had been stated in the paper, that although there was an ascertained leakage of the continuous valve, which amounted in round numbers to 10 H.P. per mile, or 30 H.P for each section of 3 miles, yet that it was only necessary to provide

15 H.P. to do that work, because in proportion as the train advanced, the amount of leakage diminished; so that the mean distance and power must be taken. Therefore, if the power required to work the air-pump, which was in effect drawing the train, was 78 H.P., and 15 H.P. sufficed for the leakage, an engine, of 93 H.P. only was required to do the work.

He submitted, that although the whole power of the engine was devoted to forming the partial vacuum, before the starting of the train, yet that unless 30 H.P. was provided, for keeping up the vacuum, which must be added to the 78 H.P. requisite to move the train, the carriages could not be propelled at an uniform velocity, as an accumulation of leakage would take place during the first $1\frac{1}{2}$ mile, where the power was deficient, and this would affect the vacuum, and dimish the tractive power. Therefore, that instead of 93 H.P. being provided for doing the work, 108 H.P. would be necessary; and if that power were not provided, the velocity of the train would be reduced, in proportion to the surplus leakage occasioned by the deficiency of the power exerted, during the passage of the train over the first part of the section.

If therefore, the time occupied by the passage of the train over the $1\frac{1}{2}$ mile was augmented, the effect of the surplus leakage on the velocity of the train, would increase in proportion, and a greater power must necessarily be exerted to propel the train.

Mr. Farey stated, that since the subject had been before the Institution he had been at Dublin, and had examined the Atmospheric Railway very minutely. To avoid repetition he would assume, that the mechanical structure, as well as the performance of the apparatus, was well known to the members, and he would therefore confine his remarks to general observations, on the merits of the system of the Atmospheric Railway.

The application to the short length of railway between Kingstown and Dalkey, could only be considered as an experiment (on a tolerably large scale) of a small portion of the length of an extensive railway line, and it would be premature, on the faith of such an experiment, to venture a prediction as to its applicability for long and important lines of railways. The experiment, as it stood, included a full trial of two circumstances, which were difficulties in railway operations, viz., a rapid inclination from the horizontal and sudden curves, The experiment, as far as it went, was extremely satisfactory, and showed that the system, in its present state, was suitable for short cross lines, or branch railways. The traffic on such branch line, would not, in many cases, repay the expense of reducing the face of the country to lines of moderate gradients and easy curves, suitable for the usual system of locomotive engines; but the atmospheric railway did not suffer much inconvenience from steep ascents and sharp curves, because the weight to be impelled up the ascent, was merely that of the carriages containing the passengers and goods, without

any additional weight appertaining to the locomotive power. Steep ascents would require more power than was required on the level portions of the same line, and hence a locomotive engine must be heavier, for a line in which steep gradients occurred at some few places, than would be necessary if the line were reduced to easy gradients throughout; so that the inevitable disadvantage of having to convey the carriages with goods and passengers up a steep ascent, was aggravated, by the circumstance of having the additional weight of the locomotive engine and tender, to convey up the same ascent, and also that weight must be greater, as the ascent was steeper. The atmospheric railway avoided this difficulty, because the power producing the locomotion being stationary, the weight of the apparatus by which that power was brought into action, had no influence on the result.

A line for this system might have several steep gradients upon it, interspersed with portions of level, or of easy gradients, as the surface of the country might happen to exist, without incurring great expense to avoid or reduce those steep gradients; each such steep gradient would be a case like the experiment at Dalkey; and a steam-engine, such as was there in use, being provided for a short length or portion of steep ascent, then, on any succeeding portion of the same line which might happen to be level, or of easy gradient, steam-engines, of like size or power, would serve a longer length; therefore the steam-engines being distributed at greater distances apart on the level and easy portions of the line, and nearer together on the steep gradients, the transport would be effected with equal facility throughout the line; or, if the steam-engines were distributed at equal distances apart, that facility might be obtained, by providing engines of greater power for the unfavorable portions, and of lesser power for the favorable portions of the line. The experiment at Dalkey showed, that the difficulty most to be apprehended in the system of the atmospheric railway was not, in fact, a very serious objection, viz., the amount of leakage of air into the exhausted tube, even when the degree of exhaustion within that tube was sufficient for conveying carriages containing passengers, or goods, up a steep gradient; and it might be expected that the present amount of leakage would be lessened in future, by improvements in the construction and management of the apparatus. It would be unwarrantable to presume, that this atmospheric railway, in its present state of only the second (or, at the utmost, the third) instance of experimental trial, should have attained the full perfection of which it was susceptible: a greater perfection, at such an early stage of trial could not reasonably be expected, and would be almost without precedent in the history of inventions. But it was an era in the history of each invention, when it was sufficiently perfected to be capable of being used at all, to answer the intended purpose. Then, if it was adopted in cases best adapted for it, its career of practical improvement commenced; and, if

the principle of action was good and had any advantages, the details of construction and management were improved imperceptibly, because many minds were set to work, each one to improve some little item, or obviate some small defect, and the aggregate of such small improvements had great effect on the progress towards important results.

The main difference between the atmospheric railway and all other existing modes of producing locomotion was, that in the existing modes, the weight of the apparatus, by which the power was obtained, must partake of the locomotion, and was an impediment thereto. Whether travelling was performed by horses drawing a carriage, or by steam-engines propelling a steam-vessel in the water, or by a locomotive steam-engine drawing carriages along a railway, or on common roads,—in each case, the weight of the horses, or steam-engines (together with the weight of a supply of fuel and water in the latter), must form a large addition to the weight of the carriage, or of the vessel with the passengers and cargo conveyed. For travelling with greater speed, there must be more of that additional weight, because more power was required, and that could only be obtained with a greater weight of apparatus. Contrary to the obviously proper course, of diminishing the weight when quicker travelling was required, the conditions of the existing modes render an increased weight necessary; and, although great improvements had been made during some years past, by progressive steps, for increasing the power of steam-engines, without a proportionate increase of their weight, and by means of such improvements, very rapid rates of travelling had been introduced, both on water and on land, nevertheless the weight of locomotive apparatus, in its present most approved state, was as much an impediment to further increase of the present rapid rates, as the greater weight of less perfect apparatus was formerly an impediment to the attainment of those rates.

When ropes were employed, for transmitting the power of stationary steam-engines to carriages, for drawing them along railways, the impediment arising from additional weight was not avoided, because the weight of rope required for the purpose was, in some cases, even greater than the weight of a locomotive steam-engine would be, for moving the same carriages, and hence nothing was gained by the substitution of stationary engines for locomotives, when long ropes were used, except for particular situations, where it might be desirable to run carriages to and from intermediate stations on a line, without stopping the principal trains, which were running at the same time, from one terminus to the other, as was the case on the Blackwall Railway. Ropes required a much greater strength than would be requisite for merely drawing the carriages steadily along the rails, when in motion, and to obtain that greater strength a great weight of rope was unavoidable; but the great strength was necessary, in

order to enable the rope to resist the shocks and snatches consequent on starting the carriages from rest into motion. If a rope was rendered so elastic that it would not transmit such snatches, it might be lighter than at present. The atmospheric railway had (not unaptly) been compared to a rope divested of weight, having competent strength for drawing the carriages along the rails, but which, being of unbounded elasticity, could not be broken. It was a valuable principle, although but little practised, whereby forcible motion was transmitted from some first mover to a distance, by the expedient of exhausting air through pipes, by the action of air pumps, and then operating at a distance from the first mover, by the pressure of the external air entering into the exhausted space, and pressing a piston before it in so entering. That principle had long been used with success for coining money, and had been tried for other purposes.

The atmospheric railway was an application of the principle, which deserved every encouragement. The power of a stationary steam-engine was thereby transmitted to a piston travelling through a long line of pipe, with any desired ratio of increased velocity of that piston, beyond the velocity of the piston of the steam-engine. The amount of loss of power attendant upon such transmission, from leakage, friction, and other defects, was chiefly a question of practice and of execution of the apparatus, and must be compared with the loss of power arising in other modes of producing like results, from friction and the augmentation of weight and friction, by the locomotive apparatus or rope; with the reservation in favour of the atmospheric railway, that it had not yet had the benefit of experience, for perfecting its details, which the other modes had. It appeared, from the experiment at Dalkey, that the loss of power, in its present state, was such as might be endured, and that might be reduced, when from experience more perfection had been given to the apparatus. There were reasons for believing, that the loss of power attendant on the mode of transmission, would not be increased, when travelling with unusually high velocities by an atmospheric railway, in anything like the same degree, as would be the case with locomotive engines, which must be of greater weight, and must, in consequence, cause more loss by friction, as they were more powerful, and better qualified for attaining high velocities, thus augmenting the loss of power in a proportion increasing rapidly with every accession of power.

The loss by leakage in the atmospheric railway, would not be materially increased at high velocities; and if the traffic on an atmospheric line were subdivided into lighter and more frequent trains, so as to obtain the high velocity without so much exhaustion in the tube, the leakage would be actually lessened with high velocities, inasmuch as there would be less time for the leakage to operate. The loss by friction would not be augmented by high velocities, and there would be only the impediment of resistance

opposed by the air to the motion of the carriages passing rapidly through it, that could cause an increasing proportion of loss of power at higher velocities. On that head, the atmospheric system had a decided advantage over locomotives, because it was only the carriages that were subject to that resistance of passing through the air, without any addition of engine and tender.

The subdivision of the traffic into lighter and more frequent trains, even at the usual speeds of railway travelling, was an advantage for public travelling, which could be obtained without inconvenience, and probably with economy, in an atmospheric railway, but which could not be had, without inconvenience and increase of expense, with locomotives.

On the whole, Mr. Farey was of opinion, that the atmospheric railway was a good and available principle, and that it was now advanced far enough towards practicability to be worthy of adoption in particular cases; and also that improvements would result from practice, after such adoption, which would show it to be worthy of more extended application.

Mr. Samuda gave a summary of the indicator diagrams taken at Dalkey, February 9th, 1842.

Mr. Braithwaite remarked upon the innovation proposed by Messrs. Samuda, in assuming a divisor of 66,000 lbs. per H.P., instead of 33,000 lbs., which was the usual divisor. He contended that, for scientific purposes, the accepted standard, given by Watt, should be adhered to, and that any commercial arrangement should be specified, as a per centage of surplus power allowed in purchasing engines. Confusion would be avoided, by not mixing commercial considerations with scientific enquiries.

Mr. Samuda said that, practically, the divisor used in the calculations of the Dalkey line, was that which was generally adopted by the manufacturers of steam-engines.

If indicator diagrams from the engines now constructed by Boulton and Watt were examined, it would be found that the divisor of 66,000 lbs. was very nearly correct.

He suggested, in order to set the question at rest, that the Institution should consider the point, and establish a correct divisor, which should be adopted as the standard of horse power.

Mr. Homersham stated, that the Government rule of calculating the horse power of marine engines was, "To multiply the area of the cylinder in square inches by 7 lbs., and this product by 240 (the speed of the piston in feet per minute), and then to divide by 33,000, the result being considered as the horse power of the engine." Now, as the average pressure on every square inch of a piston of a condensing engine was usually twice 7 lbs., and frequently more than that in the best engines, he thought that by multiplying the real average pressure on a square inch of the piston by the number of square inches of the piston's area, and that result by the velocity in feet per minute of the piston, and then dividing by 66,000, as practised by Messrs.

Samuda, the result arrived at might be received as correct, as that system would not show a smaller nominal horse power than that given by the Government standard, or indeed by the practice of any respectable maker. Although 33,000 lbs. raised a foot high per minute had been shown to be fully equal to a horse's power, yet 66,000 lbs. raised a foot high per minute, had long been the commercial standard of the horse power of a steam-engine, as supplied by the best makers.

Mr. Farey said, that competition had induced an augmentation of bulk in many measures of capacity, when considered with respect to commercial transactions. The same cause had altered the commercial horse power; but, in scientific enquiries, the accepted standard (33,000 lbs.) should alone be considered. Distinction should be made between an engine being of the dimensions for 100 H. P., and its being actually capable of exerting 100 H. P. The results would be found widely different. The sale of engines by the dimensions of the cylinder had, by custom, become, to a certain extent, a law; and he was of opinion the standard of 33,000 lbs., as fixed by Watt, should not be altered; but that commercial advantage should be stated as a per centage allowed. He acknowledged that great improvements had taken place in the construction and working of steam-engines, particularly in the reduction of the weight of marine engines; but he could not allow that the standard could yet be fixed at 66,000 lbs.

As the subject appeared to be interesting to the members, Mr. Farey promised to draw up a paper "on the standard for the horse power for scientific purposes."

Mr. Braithwaite did not complain, abstractedly, of the standard assumed by Messrs. Samuda, but he submitted, that as an arbitrary divisor of 33,000 lbs. had hitherto been generally accepted and used, it would have enabled a clearer comparison to have been drawn between the locomotive and atmospheric systems, if the same methods of calculation had been applied to both.

June 4, 1844.

The President in the Chair.

"An account of the plan employed for raising the 'Innisfail' Steamer, sunk in the river Lee, near Cork." By George Preston White, Assoc. Inst. C. E.

The 'Innisfail,' a steamer of 400 tons burthen, and 180 H. P., sunk in the river Lee, in consequence of having run foul of an anchor, with such force as to tear a plank of 64 feet in length, and varying from 8 inches to 10 inches in breadth, out of the bottom, close to the keel. As the vessel lay right athwart a narrow part of the channel, it was necessary to take immediate steps for its removal. The Directors of the St. George Steam Packet Company being aware that Mr. William Preston White, the Harbour

Master of Cork, had succeeded in raising several large vessels, solicited his assistance to remove their steamer.

The method he had adopted on former occasions was that of slinging or weighing, which is done in the following manner:—

After the position of the sunken ship has been ascertained, a chain cable is passed round it, by means of two vessels, which are placed near the bow, with the cable suspended between them, so that its centre shall sweep the ground, and it is moved to and fro, until it comes in contact with the stem of the sunken ship. The two vessels are then moved astern, the ends of the chains are brought together, and passed through an elliptical ring, which is loaded, in order that it may fall close to the stern, and the ends are secured to the vessels. The main chain being secured in its position, bridle chains are affixed to it at intermediate distances; these being attached to other vessels alongside, all the chains are strained at low water, and, as the tide flows, the sunken vessel is raised from its bed, and is brought to shore. If the vessel cannot be left high and dry at low water, the operation is repeated as often as the circumstances may require.

In this way Mr. White has succeeded in raising four sailing vessels and three steamers, besides numerous smaller craft. This plan, however, did not succeed in the case of the Innisfail, owing to the narrowness of the channel, which prevented the employment of ships of sufficient tonnage for weighing. At the suggestion of Mr. A. S. Deane, a cofferdam was constructed at the side of the vessel which had received the injury, and, to prevent any leakage at the other side, a few loads of clay ballast were deposited.

The cofferdam was formed of deal planks, 12 feet long by 3 inches thick, secured by wales and cross-pieces. On examining the bottom, after the water had been pumped out, it was found necessary to excavate to a depth of about 2 feet, in order to arrive at the leak; as the excavation proceeded, the vessel was shored up, and when the spot was discovered, elm planks of 1 inch thick and 12 inches in breadth were nailed over the whole length of the leak, first covering the hole with strips of flannel soaked in tar, in order to make the patch water-tight. By these means the vessel was raised in the course of ten tides, and it was floated and steamed down to Passage, a distance of about 7 miles, in order to undergo a thorough repair: the total expense of the work, including the cofferdam, was £350.

"Description of the Iron Shed at the London Terminus of the Eastern Counties Railway." By William Evill, Jun., Grad. Inst. C. E.

This station, which was commenced in 1840, and has proceeded to its present state, as the funds of the Company permitted, con-

tains the engineering, directoral, booking, and other offices, of the Joint Companies of the Eastern Counties and the Northern and Eastern Railways.

The trains of each company run on the same line for upwards of three miles; the Northern and Eastern Railway branching off from the Eastern Counties, at Stratford. At present, the other terminus of the Eastern Counties is at Colchester, and that of the Northern and Eastern at Bishop Stortford, with a branch to Ware and Hertford.

The station is entirely built on arches; those supporting the columns of the roof are semicircular, each of 25 feet span, and consist of five rings of brickwork. They are detached from the arches supporting the station, in order that they may not be affected by the vibration caused by the trains.

The station itself forms three sides of a rectangle, enclosing the shed on the north, south, and west sides; the trains running into the shed from the east.

The shed consists of three elliptical roofs of corrugated iron, supported on columns. The span of the centre roof is 36 feet, with a rise of 9 feet; the height of the springing line, above the rails, is 22 feet 6 inches. The span of each of the side roofs is 20 feet 6 inches, with a rise of 4 feet; the height of the springing line being 17 feet. The entire length of the shed is 230 feet.

There are two rows of seventeen cast-iron columns on each side. The columns are 13 feet 9 inches apart, and are connected immediately over the capitals, by a cast-iron elliptical open girder, ¾-inch in thickness. On this girder runs a gutter, also of cast-iron, from which the sides of the roof spring. The other sides rest on a cast-iron gutter, let into the brickwork of the station, supported by iron brackets, and strengthened by wrought-iron tie-rods, running down through the brickwork.

The columns, which are continued above the first gutter, are connected by cast-iron semicircular open panelling, and from the gutter upon this, the centre roof springs.

The corrugated iron is bolted to flanches running the whole length of these gutters. The columns are cast in two parts, the upper being let 3 feet into the lower part. Pieces are cast on the columns, to let into the girders and panelling; thus, in connecting the columns with the girders, panelling, and gutters, no bolts whatever are used.

The base of each column rests on a stone, which is firmly bedded in concrete; the circular part is continued through the stone to the backing of the arches, where it is fixed in a cast-iron shoe. At the end of the shed the columns are doubled, and are cast stronger, as they support one wall of the building.

There are three lines of rails, with a gauge of 5 feet, under the centre roof, and one line of rails and a platform, under each of the side roofs.

The corrugated wrought-iron roof is composed of sheets of No. 16 wire gauge, or $\frac{1}{17}$th inch in thickness. The arch is formed by curving the sheets of iron, in the transverse direction to the corrugated arches, and rivetting them together longitudinally.

The weight per foot of the corrugated iron is 3 lbs.; the whole weight of the centre roof, which measures 10,235 superficial feet, being scarcely 13¾ tons; and each of the side roofs, which measure 5405 superficial feet, weighs 7¼ tons.

The roof is thoroughly drained, the water running down the curve of the corrugation into the gutters, and thence through the columns to their base, whence drains are carried down the backing of the arches below, and through the piers to the ground.

The roof was erected by Messrs. Walker and Sons, of Bermondsey, who purchased the patent of Mr. H. R. Palmer, the inventor and patentee of the corrugated iron, at a charge, including fixing, of £6. 10*s.* per square of 100 superficial feet, the whole cost of the three roofs being £1365. They might, however, now be erected for nearly half that cost, as the patent has expired, and increased facilities for manufacture have been provided.

The castings were made by Messrs. Braithwaite, Milner, and Co., and the shed was designed by Mr. John Braithwaite, the engineer to the Eastern Counties Railway, and was erected under his superintendence.

Lightness and strength appear to be attained by the corrugation of iron, inasmuch as a single sheet, so thin that it will not stand alone in an upright position, will, after undergoing the process of corrugation, bear, in a vertical position, upwards of 700lbs., without bending. Its economy is manifest, from the saving it effects in other materials usually used in building; and the roofs already erected appear to have tested its durability. This roof has stood perfectly firm, and is not, in the slightest degree, altered in form, although of a large span.

Many corrugated roofs have been erected. There is one of 40 feet span, and 225 feet in length, in the entrance basin at the London Docks; one in the St. Katharine's Docks; and others on the Birmingham, Great Western, and Blackwall railways: they are, it is understood, generally approved.

Mr. Palmer has lately taken out a patent for corrugated cast-iron, which is now being used for erecting a bridge near Swansea, in South Wales. It consists of three arches; two of them of 48 feet span, and one of 50 feet span. This corrugation requires no rivetting, as the joint is cast on the plate, and the construction of the bridge is stated to be much simplified by the use of iron in that form.

NEW MAGNETO-ELECTRIC MACHINE.

BY PROF. C. G. PAGE.

(*Extracted from the Report of the American Commissioner of Patents for* 1844.)

In 1838, Prof. Page published in Silliman's Journal an account of an improved form of Saxton's magneto-electric machine, doing away with many existing objections, and furthermore rendering it at once a useful instrument, by a contrivance for conducting these opposing currents into one channel or direction, which part of the contrivance was called the unitress. The current produced in this way was capable of performing the work, to a certain extent, of the power developed by the galvanic battery; and the machine was found adequate to furnishing of shocks for medical purposes, for exhibiting the decomposition of water, furnishing the elements oxygen and hydrogen at their respective poles, and producing definite electro-chemical results. These two last results could not be obtained without the aid of the unitress. But, with this improvement, the instrument was still wanting in one property of the galvanic battery—viz. that property which chemists call quantity, or that power upon which depends its ability to magnetize, and also to heat platinum wires. This last property has been given to the machine by the recent contrivance of Prof. Page. The machine, in its novel construction under his improvement, developed what is called by way of distinction, the current of intensity, but had a very feeble magnetizing power. By a peculiar contrivance of the coils, (not to be made public until his rights are in some way secured,) the current of quantity is obtained in its maximum, while at the same time, the intensity is so much diminished that it gives scarcely any shock, and decomposes feebly. It has been successfully tried with the magnectic telegraph of Prof. Morse, and operates equally well with the battery. It affords, by simply turning a crank attached to the machine, a constant current of galvanic electricity; and as there is no consumption of material necessary to obtain this power, it will doubtless supersede the use of the galvanic battery, which, in the event of constant employment, would be very expensive, from the waste of zinc, platinum, acids, mercury, and other materials used in its construction. It particularly recommends itself for magnetising purposes, as it requires no knowledge of chemistry to insure the result, being merely mechanical in its action, and is always ready for action without previous preparation; the turning of a crank being the only requisite, when the machine is in order. It is not liable to get out of order; does not diminish perceptibly in power when in constant use, and actually gains power when standing at rest. It will be particularly gratifying to the man of science, as it enables him to have always at hand a constant power for the investigation of its pro-

perties, without any labour of preparation. We notice among the beautiful results of this machine, that it charges an electro-magnet so as to sustain a weight of one thousand pounds, and it ignites to a white heat large platinum wires, and may be used successfully for blasting at a distance; and should Government ever adopt any such system of defence as to need the galvanic power, it must supersede the battery in that case. Prof. Page demonstrates, by mathematical reasoning, that the new contrivance of the coils affords the very maximum of quantity to be obtained by magnetic excitation.

OSMIUM AND IRIDIUM—MEANS OF OBTAINING THEM PURE. BY M. FREMY.

ONE hundred parts of the residue of the platinum ore, after the platinum has been entirely extracted, is fused with 300 parts of nitre, and kept red hot for an hour; after this calcination, it is poured upon a metallic plate, taking care to protect the skin from the vapours of osmic acid. The mass is introduced into a retort, and treated with nitric acid, which disengages the osmic acid that is to be condensed in a concentrated solution of potash; that is afterwards to be treated with a little alcohol, which causes the formation of a salt (osmite of potash), and its subsequent deposition in the form of a red crystalline powder: the salt can be washed with alcohol. By adding to the osmite a cold solution of sal ammoniac, it is first dissolved, and subsequently decomposed, giving rise to a yellow salt but slightly soluble in water. It is from this that the *pure osmium* is obtained by heating it in a current of hydrogen gas. To obtain the *pure iridium*, the residue left in the retort, after driving off the osmic acid, is first treated with water to wash away the nitre; and the impure oxide of iridium afterwards dissolved in hydrochloric acid. To this solution sal ammoniac is added, which forms an insoluble double salt of iridium and ammonia, as well as a little chloride of osmium and ammonia. This impure salt is suspended in water, and a current of sulphurous acid gas passed through; this dechlorates the iridium salt, rendering it very soluble in water, while the double salt of osmium and ammonia is not altered. This soluble salt of iridium crystallizes in large prisms, of a brown color, from a solution of sal ammoniac; and by heating them in a current of hydrogen, pure iridium is obtained.—[*Comptes Rendus.*]

HYDRIDE OF COPPER.—BY A. WURTZ.

THIS is a combination of hydrogen and copper, formed by dissolving 1 part of hypophosphite of baryta in water, precipitating the baryta by sulphuric acid, and adding to the filtered solution 0·8 parts of the sulphate of copper in solution (concentrated); the mixture is then gently heated to a temperature not exceeding 70° C. (150° Fah.), and not even that, if hydrogen escapes. It

is a yellow powder, presenting the appearance of kermes; in washing, it is necessary to do so with water deprived of air, and in an atmosphere of carbonic acid. When dry, it inflames in chlorine; hydrochloric acid acts in a singular manner upon it, decomposing it with the production of a lively effervescence of hydrogen, and the dichloride of copper is formed. This is very remarkable, as hydrochloric acid does not act on copper when alone, and one would presume that it would be less apt to do so when hydrogen was present; but this is another instance of the remarkable decomposition by contact, as in the case of the peroxide of hydrogen, &c. In the reaction just mentioned, hydrogen escapes from the acid, as well as from the hydride. The composition of this body is,—

$$\left.\begin{array}{ll} Cu, & 98{\cdot}780, \\ H, & 1{\cdot}220, \end{array}\right\} \text{corresponding to } Cu^8\,H^3.$$

The copper combines with 1200 times its volume of hydrogen.—[*Comptes Rendus.*]

TO SEPARATE ZINC FROM MANGANESE.—BY M. OTTO.

The solution of the two metals containing hydroclorate of ammonia is rendered slightly alkaline, and then there is added to it hydrosulphuric acid, which precipitates the two metals. To the precipitates acetic acid is added, which dissolves the sulphuret of manganese alone. This property of the sulphuret of manganese can be taken advantage of to separate from all other metals.—[*Jour. de Pharm. et de Chim.*]

CHLORAZOTIC ACID.—BY M. BAUDRIMONT.

The property that aqua regia has of dissolving gold and platinum, and which has been supposed to be due to the presence of chlorine, is shewn to be owing to a peculiar acid, having for its composition $Az\,\overline{O^3Ch^2}$. It can be obtained by mixing together two parts of nitric and three parts of hydrochloric acids of commerce, when it escapes in the form of red fumes, mixed at first with the vapour of a little hydrochloric acid; it can be condensed in a U tube, placed in salt and ice, and then appears as a liquid of a deep red color; in this state it attacks all metals, when brought in contact with them; with finely-divided silver, it explodes immediately. In acting on metals it forms a chloride and a nitrate. Its action on metallic oxides indicates that it is an acid of a definite character, being represented by nitric acid, with two atoms of oxygen substituted by two atoms of chlorine.—[*Journ. de Pharm. et de Chim.*]

THE OXIDES OF GOLD, PURPLE OF CASSIUS, AND FULMINATING GOLD.—BY L. FIGUIER.

The green powder described by chemists as the protoxide of gold is found to be a mixture of metallic gold with the oxide.

This latter, instead of having the extreme instability ordinarily allotted to it, is found to be the most unalterable of all the oxides of this metal. It is a violet powder so dark as to appear black when in a hydrated state. It is an indifferent compound, combining with both bases and acids. The hydracids produce a deposit of gold, dissolving a tritoxide that is formed. With ammonia it forms a violet fulminating compound; at 250° C. (482° Fah.) it is decomposed. The protoxide can be procured in various ways by treating the neutral trichloride of gold with the protonitrate of mercury; by acting upon the tritoxide of gold with acetic, or almost any of the organic acids, or with the salts of their acids, vegetable or animal matter produces the same effect. Figuier thinks that he has discovered a compound of gold and oxygen containing more oxygen than any of its oxides previously known—it is called *perauric acid.* Its composition has not yet been made out; it is formed under the following circumstances:—when the tritoxide of gold is boiled with caustic potash, there is formed an abundant precipitate of the protoxide of gold, without any escape of oxygen, which must therefore combine with a portion of the tritoxide, forming a compound more highly oxygenated, that remains dissolved in the potash. *The purple of Cassius*, when pure, is shewn to be a neutral stannate of the protoxide of gold; without regard to the manner in which it may be formed its formula is 3 ($St\,O^2$) $Au^2\,O+4HO$. The stannic acid has been shown by Fremy to require three equivalents for the formation of the neutral stannates. There is also a bi-stannate of the protoxide, 6 ($St\,O^2$) $Au\,O+4HO$. The *fulminating gold* is supposed to be rather a compound of the oxide of gold and ammonia than a nitride of gold, as advanced by Dumas; the principal reason for so thinking, is that there are as many varieties of fulminating gold as their oxides of this metal. [*Compt. Rend.*]

SACCHARIC ACID.—BY M. HEINTZ.

He has succeeded in preparing this acid, without any difficulty, in a state of purity, by treating 1 part of sugar with 3 parts of nitric acid of 1·25 sp. gr. and not heating it higher than 122° F. By attending closely to the temperature, no trace of oxalic acid is formed. After the reaction is completed, the mixture is saturated with carbonate of potash; then acetic acid is added, until the mass smells of it, when the slightly soluble bisaccharate of potash is left undissolved, and, if dried between blotting paper and re-crystallized, it can be obtained perfectly pure; from this the saccharate of cadmium is formed, and decomposed by hydrosulphuric acid to furnish the saccharic acid, (the lead salt will not answer for this purpose.) The acid can be obtained as a brittle mass, by evaporation and desiccation, in a vacuum with sulphuric acid.—[*Beric. Konigl. Preuss. Akad.*]

LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

1845.

June 27. *Samuel Reade*, of 77, Cornhill, London, for a disc for near-sighted persons.

July 2. *Joshua Leonard Brierley*, of 104, Dale-end, Birmingham, for an improved expanding music folio.

3. *John Powell*, of 59, Paddington-street, St. Marylebone, for a lever rail for portable military bedsteads.

3. *Frederick Fovaux Weiss*, of the Strand, for an improved scarificator.

4. *F. W. Lee*, of 3, Grove Cottages, Holloway, for a domestic and portable fire-escape.

5. *Adams, Jordan, and Co.*, of 20, Pump-row, Old-street road, London, for a spring waggon.

5. *John Dunton*, of Willenhall, Staffordshire, for a case and staple for tumbler and spring-locks for trunks.

5. *Keeble Constable*, of Park-street, Cambridge, for an improved trefoil and clover-seed drawing machine.

8. *Benjamin Rider*, of 61, Red Cross-street, Southwark, for a hat leather.

9. *Burge, Neate, & Co.*, of Batheaston, for a self-regulating wind engine.

10. *Abraham Newland*, of Stratford-upon-Avon, for a flexible saddle.

11. *David Glasgow*, of Birmingham, for a portable fire-engine.

12. *George David Doudney, and James Doudney*, of 17, Old Bond-street, London, for a cloak.

12. *Thomas Graves*, of Old Bolingbroke, Lincoln, for a design for regulating the position of a plough-share and coulter of a plough.

14. *Edward Taylor Bellhouse*, of Manchester, for fire-proof doors for hoists in mills, warehouses, and other buildings.

14. *Joseph Beaumont*, of Batty-street, Commercial-road, for an anti-friction valve.

16. *Lingham Brothers*, of 170, Little Hampton-street, Birmingham, for a union fastener for sashes and tables.

July 16. *John Bye*, of Titchborne-court, Holborn, for a bug trap.

17. *Jeremiah Johnson*, of Botley, for an apparatus for raising and lowering persons and goods.

18. *Frederick Allies*, of Worcester, for the Archimedean minnow.

19. *Henry Salter*, of 29, Charing Cross, London, for spring soles for boots and shoes.

19. *James Balster Sampson*, of Maidstone, for a spiral water-heater.

22. *Edmund Rudge*, of Tewkesbury, for an improved tap or cock.

22. *George Glover*, of Huntingdon, for a safety horse-padlock.

24. *Henry Putland and Charles Woods*, of 60, Crown-street, Finsbury, for a shaft tug.

24. *Edward Smith*, of 8, Avery Row, New Bond-street, for an Archimedean roller for window blinds, plans, maps, &c.

List of Patents

That have passed the Great Seal of IRELAND, to the 17th of July, 1845, inclusive.

To William Edwards Staite, of High-street, Marylebone, in the county of Middlesex, Gent., for certain improvements in the processes and apparatus for preparing extracts and essences.—Sealed 1st July.

Thomas Lawes, of Old Kent-road, in the county of Surrey, Gent., for improvements in propelling carriages on rail and other roads, and boats or vessels on canals or rivers; which improvements are also applicable to machinery in general.—Sealed 3rd July.

Alexander Mc Dougall, of Daisy Bank, in the county of Lancaster, Gent., for improvements in the method of working atmospheric railways; which improvements are also applicable to canals and rivers.—Sealed 3rd July.

John Baptiste Simeon Teissier, of Paris, engineer, and Antoine Hippolyte Triat, of Paris, professor of gymnastics, for improvements in propelling vessels, carriages, and agricultural machines.—Sealed 5th July.

John Taylor, of the Adelphi, in the county of Middlesex, Gent., for improvements in separating metals from each other, and from certain combinations with other substances.—Sealed 5th July.

William Cormack, of Dalgleish-street, Commercial-road, in the county of Middlesex, chemist, for improvements in purifying gas.—Sealed 5th July.

John Parsons, of 2, Stones-row, St. Pancras, in the county of Middlesex, machinist, for certain improvements in the manufacture of fuel, and an apparatus for the use of the same.—Sealed 10th July.

James Napier, of Hoxton, in the county of Middlesex, dyer, for improvements in treating mineral waters, to obtain products therefrom, and for separating metals from other matters.—Sealed 11th July.

John Ainslie, of Redheugh, near Dalkeith, in North Britain, for improvements in the apparatus and arrangements for the manufacture of tiles and similar articles, from clay and other plastic matters.—Sealed 14th July.

Henry Pinkus, of 36, Mount-street, Grosvenor-square, Middlesex, for improvements in obtaining and applying motive power in impelling machinery.—Sealed 16th July.

List of Patents

Granted for SCOTLAND, subsequent to June 22nd, 1845.

To Robert Addison, of Regent-street, London, piano-forte manufacturer, for improvements in piano-fortes,—being a foreign communication.—Sealed 23rd June.

Charles Smith, of 13, Newcastle-street, Strand, London, for new and improved methods in the construction and application of a variety of cooking, culinary, and domestic articles and utensils; some of which are applicable to cleaning, and a variety of similar useful purposes.—Sealed 24th June.

James Johnston, of Willow Park, Greenock, for new and improved processes and machinery for making and refining sugar.—Sealed 26th June.

Auguste Cherot, of Nantes, France, spinner, for certain improvements in machinery for spinning flax, hemp, and other fibrous substances,—being a foreign communication.—Sealed 30th June.

Charles Wheatstone, of Conduit-street, London, and William Fothergill Cooke, of Redbrooke, near Blackheath, Kent, for improvements in electric telegraphs, and in apparatus relating thereto, part of which improvements are applicable to other purposes.—Sealed 3rd July.

David Gavin Scott, residing at Coomwell Park, Perthshire, for an invention by which the headles of a loom are moved, to produce various patterns on woven fabrics,—being a foreign communication.—Sealed 4th July.

James Kite, of Hoxton, London, coal merchant, for certain improvements in constructing chimneys, and in the means used for sweeping the same, parts of which improvements are applicable to other like useful purposes.—Sealed 4th July.

Patrick Sandeman, of Greenside-place, Edinburgh, for improvements on coffins.—Sealed 9th July.

William Mather and Colin Mather, of Salford, engineers, for certain improvements in boring earth, stone, and subterraneous matter, and in the machinery, tools, or apparatus applicable to the same.—Sealed 10th July.

Henry Pinkus, of 36, Mount-street, Grosvenor-square, London, for improvements in obtaining and applying motive power, in impelling machinery.—Sealed 17th July.

Joseph Armstrong, of Devonshire-street, Portland-place, London, surgeon, for improvements in apparatus for the relief or correction of stiffness, weakness, or distortion, in the human body.—Sealed 18th July.

Thomas William Gilbert, of Limehouse, county of Middlesex, sailmaker, for improvements in the construction of sails for ships and other vessels.—Sealed 18th July.

Alexander Wright, of South Lambeth, London, for improvements in gas-meters.—Sealed 21st July.

New Patents

SEALED IN ENGLAND.

1845.

To Isham Baggs, of Great Percy-street, Claremont-square, Middlesex, engineer, for improvements in obtaining motive power by air. Sealed 26th June—6 months for inrolment.

Alexander Angus Croll, of Bow Common, Middlesex, chemist, for improvements in manufacturing, measuring, and transmitting gas; and in obtaining ammoniacal and other products from the refuse matters of such manufacture. Sealed 26th June—6 months for inrolment.

Bower St. Clair, of Manchester-street, Manchester-square, Gent., for improvements in the manufacture of sugar,—being a communication. Sealed 26th June—6 months for inrolment.

Dominic Frick Albert, of Manchester, operative chemist, L.L.D., for an improved application of materials to the manufacture of soap. Sealed 28th June—6 months for inrolment.

James Hall Nalder, of Alvescott, Oxfordshire, Gent., for improvements in drills for drilling corn, grain, and manure. Sealed 28th June—6 months for inrolment.

Alphonse le Mire de Normandy, of Dalston, Middlesex, Gent., for improvements in the manufacture of thimbles and finger shields. Sealed 28th June—6 months for inrolment.

Simon Snyder, of Dayton, in the State of Ohio, in the United States of America, mechanic, for improvements in tanning hides and skins. Sealed 28th June—6 months for inrolment.

Charles Goodwin, of Bow-lane, ship surveyor, for certain improvements in masts and spars. Sealed 30th June—6 months for inrolment.

Philippe Poirier de Saint Charles, of Norfolk-street, Strand, civil engineer, for certain improvements in the production of type for printing, and in the machinery employed for the same. Sealed 1st July—6 months for inrolment.

Stephen Hutchison, of the London Gas Works, Vauxhall, engineer, for certain improvements in gas-meters. Sealed 2nd July—6 months for inrolment.

François Marie Agathe Dez Maurel, of Marlborough-terrace, Old Kent-road, Gent., for improvements in the manufacture of soap. Sealed 3rd July—6 months for inrolment.

John Hopkins, of Rector-place, Woolwich, Gent., for certain improvements in rails and trams for rail-roads and tram-ways. Sealed 3rd July—6 months for inrolment.

Thomas Walker, of Euston-square, mechanic, and George Mills, of Dover, coal merchant, for certain improvements in springs and elastic power, as applicable to railway carriages and other vehicles, and to other articles and purposes in which springs or elastic power is now used. Sealed 3rd July—6 months for inrolment.

William Simmons, of Oldham, Lancashire, hat manufacturer, for certain improvements applicable to hats, caps, and bonnets. Sealed 3rd July—6 months for inrolment.

William Mather, and Colin Mather, of Salford, Lancashire, engineers, for certain improvements in boring earth, stone, and subterraneous matter, and in the machinery, tools, or apparatus applicable to the same. Sealed 3rd July—6 months for inrolment.

William Newton, of the Office for Patents, 66, Chancery-lane, Middlesex, civil engineer, for certain improvements in railways, and in the means of propelling carriages,—being a communication. Sealed 3rd July—6 months for inrolment.

Lemuel Goddard, of Crescent, America-square, London, merchant, for improvements in the manufacture of candles, and in the means of preventing them from guttering whilst burning,—being a communication. Sealed 3rd July—6 months for inrolment.

William Symes, of Victoria-road, Pimlico, grocer, for certain apparatus for dividing lump sugar. Sealed 3rd July—6 months for inrolment.

George Myers, of Laurie-terrace, Westminster-road, Lambeth, builder, for improvements in cutting or carving wood, stone, and other materials. Sealed 8th July—6 months for inrolment.

John Greenwood, of Church, manufacturing chemist; John Mercer, of Oakenshaw, chemist; and John Barnes, of Church, Lancaster, manufacturing chemist, for certain improvements in the manufacture of certain chemical agents used in dyeing and printing of cotton, woollens, and other fabrics. Sealed 8th July—6 months for inrolment.

Jacob Brett, of Hanover-square, Esq., for improvements in propelling carriages on railways and other roads and ways,—being a communication. Sealed 8th July—6 months for inrolment.

John Leifchild, of Minories, blue manufacturer, for improvements in the manufacture of blue, to be used as a substitute for stone blue. Sealed 8th July—6 months for inrolment.

Antoine Bossy, of Paris, merchant, for improvements in manufacturing water-proof paper. Sealed 10th July—6 months for inrolment.

John Samuel Templeton, of Sussex-place, Kensington, artist, for improvements in propelling carriages on railways. Sealed 12th July—6 months for inrolment.

Hugh Cogan, merchant and manufacturer, of West George-street, Glasgow, for an improved method or methods for weaving in patterns, or various colors, or fabrics. Sealed 12th July—6 months for inrolment.

Edmund Ratcliff, of Birmingham, manufacturer, for a certain improvement or certain improvements in the furniture of door-locks and latches. Sealed 12th July—6 months for inrolment.

William Chantrell, of Leeds, Gent., for certain improvements in weaving machinery. Sealed 12th July—6 months for inrolment.

Joseph Fulton Meade, of Dublin, Gent., for certain improvements in steam-engines and boilers. Sealed 12th July—6 months for inrolment.

Samuel Trethewey, of Water Grove Mine, near Stoney Middleton, Derby, civil engineer, and Joseph Quick, of Sumner-street, Southwark, engineer, for an improved combined expansive steam and atmospheric engine. Sealed 12th July—6 months for inrolment.

Horatio Sydney Sheaf, of Waterloo-place, Old Kent-road, artist, for certain improvements in obtaining and applying motive power. Sealed 12th July—6 months for inrolment.

Thomas Russell Crampton, of Southwark-square, engineer, for improvements in match-boxes, or articles to be used in the production of instantaneous light, and in the machinery for manufacturing the same. Sealed 12th July—6 months for inrolment.

Richard Simpson, of the Strand, London, Gent., for certain improvements in bleaching yarns and fabrics,—being a communication. Sealed 12th July—6 months for inrolment.

Joseph Malcomson, of Portlaw, Ireland, for improvements in apparatus used for propelling carriages on roads, and vessels on inland waters, when employing atmospheric pressure. Sealed 12th July—6 months for inrolment.

John Shaw, of Broughton, in Turness, Lancashire, chemist and druggist, for a hydro-pneumatic engine. Sealed 12th July—6 months for inrolment.

Patrick Sandeman, of Greenside-street, Edinburgh, upholsterer, for improvements on coffins. Sealed 21st July—6 months for inrolment.

John James Sinclair, of Helmet-row, Middlesex, hot-presser, for certain improvements in producing glossy surfaces on paper and similar materials. Sealed 21st July—6 months for inrolment.

Thomas Robinson Williams, of Love-lane, Aldermanbury, Gent., for an improved process and machinery for rendering paper and wrappers waterproof. Sealed 21st July—6 months for inrolment.

Julius Adolph Detmold, of the city of London, merchant, for improvements in the means of applying steam as a motive power —being a communication. Sealed 21st July—6 months for inrolment.

William Broughton, of New Basinghall-street, London, millwright, for improvements in machinery or apparatus for grinding grain, drugs, colors, or other substances. Sealed 21st July— 6 months for inrolment.

Thomas William Gilbert, of Limehouse, sail-maker, for improvements in the construction of sails for ships and other vessels. Sealed 21st July—6 months for inrolment.

Angier March Perkins, of Francis-street, Regent's-square, St. Pancras, civil engineer, for certain improvements in the apparatus or method of heating the air in buildings, heating and evaporating fluids, and heating metals,—being an extension, for the term of 5 years from the 30th instant, of his former patent of July 30th, 1831. Sealed 21st July.

Jacob Brett, of Hanover-square, Gent,, for improvements in atmospheric propulsion, and in the manufacture of tubes for atmospheric railways, and other purposes,—being a communication. Sealed 21st July—6 months for inrolment.

Michel Perrier, of Lymington, Gent., for improvements in spinning and twisting cotton, flax, silk, and other fibrous materials, —being a communication. Sealed 21st July—6 months for inrolment.

John Lings, of Spur-street, Leicester-square, cheesemonger, for improvements in apparatus for the preservation of provisions. Sealed 21st July—6 months for inrolment.

Charles de Bergue, of Arthur-street West, London, merchant, for certain improvements in rollers and other machinery or apparatus to be employed in flattening, preparing, and polishing wire, for the construction or manufacture of reeds for weaving; the rollers being applicable to other like purposes. Sealed 24th July—6 months for inrolment.

CELESTIAL PHENOMENA FOR AUGUST, 1845.

D.	H.	M.	
1			Clock before the sun, 6m. 0s.
—			☽ rises 2h. 45m. M.
—			☽ passes mer. 10h. 38m. M.
—			☽ sets 6h. 22m. A.
	12	29	♃ in □ with the ☉
3	7	25	Ecliptic conj. or ● new moon
3	18	20	☿ in the descending node
4	11	11	♃'s first satt. will im.
4	23	34	♀ in conj. with the ☽ diff. of dec. 6. 46. N.
5			Clock before the sun, 5m. 4
—			☽ rises 7h. 2m. M.
—			☽ passes mer. 1h. 37m. A.
—			☽ sets 8h. 0m. A.
	5	13	☿ in conj. with the ☽ diff. of dec. 4. 53. N.
6	10	16	♃'s second sat. will im.
	12	44	♃'s second sat. will em.
6	18		♂ greatest hel. lat. S.
7	20	59	♄ in oppo. to the ☉
10	10	41	☽ in □ or first quarter
10			Clock before the sun, 5m. 5s.
—			☽ rises 0h. 45m. A.
—			☽ passes mer. 5h. 34m. A.
—			☽ sets 10h. 8m. A.
11			Occul. ϖ1 Scorpii, im. 10h. 24m. em. 10h. 58m.
			Occul. ϖ2 Scorpii, im. 10h. 26m. em. 11h. 29m.
11	13	5	♃'s first sat. will. im.
12			Occul. 28 Scorpii, im. 9h. 28m. em. 10h. 21m.
13	12	53	♃'s second sat. will im.
	15	21	♃'s second sat. will em.
13	21	56	☿ in Aphelion
			Occul. μ1 Sagittarii, im. 11h. 44m. em. 12h. 47m.
			Occul. μ2 Sagitarii, im. 12h. 41m. em. 13h. 19m.
14			Occul. *d* Sagittarii, im. 12h. 22m. em. 13h. 25m.
15			Clock before the sun, 4m. 14s.
—			☽ rises 5h. 47m. A.
—			☽ passes mer. 10h. 29m. A.
—			☽ sets 1h. 59m. M.
	4	35	☿ greatest elong. 27. 22. E.
	10		☽ in Perigee
16	13	6	♄ in conj. with the ☽ diff. of dec. 6h. 23m. S.
17			Mercury R. A. 11h. 25m. dec. 1. 61. N.
—			Venus R. A. 11h. 23m. dec. 5. 17. N.
—			Mars R. A. 22h. 1m. dec. 19. 21. S.
—			Vesta R. A. 4h. 29m. dec. 15. 45. N.
—			Juno R.A. 11h.35m. dec. 4.46.N.
—			Pallas R. A. 19h. 55m. dec. 13. 45. N.
—			Ceres R. A. 22h. 27m. dec. 25. 31. S.
—			Jupiter R. A. 2h. 34m. dec. 13. 44. N.
—			Saturn R. A. 21h. 10m. dec. 17. 25. S.
—			Georg. R. A. 0h. 37m. dec. 3. 14. N.
—			Mercury passes mer. 1h. 42m.
—			Venus passes mer. 1h. 40m.
—			Mars passes mer. 12h. 16m.
—			Jupiter passes mer. 16h. 48m.
—			Saturn passes mer. 11h. 26m.
—			Georg. passes mer. 14h. 52m.
17			Ceres in Aphelion
	1	17	Ecliptic oppo. or ○ full moon
	10	21	♂ in conj. with the ☽ diff. of dec. 12. 33. S.
18	3	10	♂ in oppo. to the ☉
	11	22	☿ in conj. with ♀ diff. of dec. 3. 59. S.
	14	59	♃'s first sat. will im.
19	10	40	♃'s third sat. will em.
20			Clock before the sun, 3m. 9s.
—			☽ rises 8h. 6m. A.
—			☽ passes mer. 2h. 4m. M.
—			☽ sets 8h. 41m. M.
			Occul. δ Piscium, im. 8h. 26m. em. 9h. 21m.
	8	21	♅ in conj. with the ☽ diff. of dec. 4. 14. S.
	9	27	♃'s first sat. will im.
	15	30	♃'s second sat. will im.
	21	39	Ceres in oppo. to the ☉, intens. of light 0·672
21	0	48	♀ in conj. with Juno. diff. of dec. 1. 2. N.
22	15	34	♃ in conj. with the ☽ diff. of dec. 2. 13. S.
24	6	27	☽ in □ or last quarter
25			Clock before the sun, 1m. 53s.
—			☽ rises 10h. 53m. A.
—			☽ passes mer. 6h. 9m. M.
—			☽ sets 2h. 13m. A.
	16	52	♃'s first sat. will im.
22	11	21	♃'s first sat. will im.
	11		☽ in Apogee
28	13	53	☿ stationary
30			Clock before the ☉ 0m. 27s.
—			☽ rises 2h. 47m. M.
—			☽ passes mer. 10h. 5m. M.
—			☽ sets 5h. 20m. A.
	10	23	♂ in Perihelion
	11	42	♃ stationary
31	9	53	♃'s second sat. will em.

J. LEWTHWAITE, Rotherhithe.

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RECENT PATENTS.

To James Pilbrow, *of Tottenham, in the county of Middlesex, civil engineer, for certain improvements in the machinery for, or a new method of, propelling carriages on railways and common roads, and vessels on rivers and canals.*—[Sealed 17th May, 1844.]

This invention consists in a novel method of propelling carriages on railways and common roads, and vessels on rivers and canals, by means of atmospheric pressure; the principal feature of which is the dispensing with the continuous valve hitherto applied to the tube or main wherein the piston travels; and another feature of this invention is avoiding the discontinuance of the tube, and the construction of bridges, &c., where the line of railway is crossed by any other railway or road.

In Plate IV., fig. 1, represents a longitudinal section of part of a pipe or tube, supposed to be lying along a railway between the rails, similar to the tube described in the various plans hitherto devised for propelling carriages on the "atmospheric principle;" but here it is proposed that it shall lie in a hollow or channel, dug in the earth, and be fastened also in any convenient manner to the sleepers. At intervals (say at

thirty feet, or nearer) along this tube there are affixed pinions or small cogged wheels, as shewn at *a*, and *b*, (and more clearly in the enlarged view, fig. 12,) made or cast in one solid piece of iron: the upper portion *c*, having cogs or teeth around it (say ten or twelve), and the lower portion *d*, being made the same, so that the cogs or teeth may correspond both in situation, size, and number; the portion *e*, between these cogged portions, forms a spindle or axis of connection between them, and projecting at each end, as shewn at *f*, and *g*, forms centres or pivots to work in bearings, as hereafter explained. By reference to fig. 10, which represents the tube in transverse section, it will more easily be seen how this pinion is placed, and how it acts; the tube has a projection upon it, at the places where these pinions are to be situated, and also has an opening in it, to allow the pinion *d*, to enter, and project a short distance into the hollow of the tube; the upper and lower ends of the spindle *e*, working in holes or bearings made for that purpose in this projecting case or box, as at *h*, *i*. That part of the spindle or axis between the toothed portions does not touch, but passes through a hole or passage *j*, in the box, larger than the spindle; but there is a flat or conical part *k*, which is allowed to touch, as will be explained hereafter. A piston, hereafter more particularly described, is made to fit as nearly air-tight as possible in this tube, having attached to it, behind, a long bar, or piece or pieces of iron, or other suitable material, with cogs or teeth along the edge or edges, to correspond and fit into the cogs or teeth of the pinions. Fig. 2, is a side view, and fig. 3, a plan or top view of the piston, and its rack, which is here shewn as a double one, that is, having cogs on both edges; *l*, *l*, represents the piston head; *m*, the line of cogs; and *n*, is a wheel or roller, placed near the centre of the rack, to support it in its proper place, and to prevent friction in its progression. Fig. 4, represents the front end view of the piston, and fig. 5, a section of the rack and wheel *n*, at the dotted line 1, 2. The cogs are not continued the whole depth of the rack, but at the lower part there is a plain piece *o*, *o*, which, at the piston end, declines or approaches the bottom, forming a small inclined plane, as shewn at *p*, p^1, there being no cogs at the very

commencement p^1. This rack is sufficiently long to reach two or more sets of the pinions in the tube, so that it will touch and actuate one set before it leaves another. The pinions are so arranged that they project at about the middle or horizontal diameter of the tube, and the rack is arranged in the same position as to the piston, so that when the piston is placed in, or allowed to pass along, the tube, the rack will act upon, and be in gear with the pinion *d*, and if a vacuum be formed, by pumping out or exhausting the air from the front of the piston, the pressure of the atmosphere will urge the piston and its rack onwards towards the vacuum, if permitted to do so; and the rack being in gear with the pinions *d*, will, as it passes, cause them to revolve, and also the pinions *c*, which are outside the tube. There may be pinions on each side of the tube, opposite each other, as shewn in fig. 6, (which is a plan view of the tube), and in the transverse section, fig. 11, if thought advisable, which will render it necessary that the rack should be double, or cogged on both edges, as shewn at fig. 3; and which is considered to be the case throughout the following description, as being the most comprehensive form, although single racks and pinions may be found generally the better plan in practice, when the difference is merely the use of one pinion instead of two, as before described, and the racks being cogged only on one side; the carriage-rack, in this case, having a guide to keep it to the pinion, which guide may be a plain upright, or a plain or un-cogged pinion, in place of the cogged pinion so removed.

To the under part of a railway carriage, in any convenient manner, will be attached a rack *q*, similar to the piston-rack. This rack is called the "carriage-rack," and is shewn in plan at fig. 7. The front end *r*, is tapered or pointed, to facilitate its entrance between the pinions; *s, s*, shew where the rack is attached to the carriage, as hereafter described. Fig. 8, represents a side view, and fig. 9, a front view of the carriage-rack; this rack is made to correspond precisely with the piston-rack, and will be of the exact width that the pinions are apart, so as to be in gear, like the piston-rack, with the two opposite pinions at the same time; it is also of the same

length as the other, so that it may reach two or more of the pinions or pairs of pinions at once.

Fig. 11, is a transverse section of the tube, with opposite pinions, (supposed to be taken through the dotted lines 3, 4, of figs. 6, and 8,) shewing the racks *m*, and *q*, in gear respectively with the pinions at *t*, *t*. The boxes or projections *u*, *u*, which contain the lower pinions, have a hollow or chamber, to permit the said pinions to revolve freely, but are made and put on the tube air-tight, having but one opening into the inner part or chamber, viz., at *j*, through which the spindle of the pinion passes. To admit of the pinion being put into its place, the box must be made to separate, and to be fixed together with air-tight joints, at the dotted lines *v*, *v*, by bolts *w*, *w*. To make the passage of the spindle from exterior to interior of the tube air-tight, a conical or bevilled shoulder is formed on the spindle, below the upper pinion; the upper edge of the passage through which the spindle passes is also bevilled, and the conical part of the spindle is truly ground to this part, so that, when down in its place, the conical part fits air-tight, in the manner of the common valve known by the name of the "spindle or conical valve." Instead of making the shoulder conical, a simple flat shoulder may be used, ground true to the edges (horizontally) of the upper part of the passage. A combination of these two is shewn at figs. 11, and 12, where, instead of the flat shoulder, a flat plate or disc is employed, through which the spindle passes, having a conical part ground to a corresponding surface in the plate, as at *x*, fig. 12. This modification is for the purpose of preventing much friction, when the passage is required to be large, in case of the pinions turning round when pressure is upon them, thus permitting the smaller circumference of the two (the conical) turning instead of the larger flat one at its outer edges, where it will lie upon the "pinion-box" at 2, 2, fig. 11. In order that the pinions may be lifted up, and, consequently, the valve rise from its seat, (as shewn in fig. 11,) the pivots are made long enough, and the chamber in the box large enough, to permit it. When the pinions are lifted up, a free passage is allowed for the ingress of air into the tube; and to make this passage, under

these circumstances, as large and free as possible, several side passages may be made also, as at 3, 3, figs. 10, and 11. When the piston-rack is within the tube, in its desired situation, and the cogs of the pinions in gear with those of the rack, the lower surface of the pinion-cogs will rest upon the plain piece *o*, of the piston-rack, which makes a kind of shelf or ledge for the cogs; and thus, if this rack be so arranged as to move in a line rather higher than that in which the pinions are placed, when down, (as in fig. 10,) it will cause them to be lifted up when it passes them, thereby avoiding the friction of the air-tight shoulders, and permitting air to enter into the tube, during this action, as may be essential to the efficacy of the apparatus, as will be further explained hereafter.

The carriage-rack may be attached to the under part of a railway carriage (the first carriage of a train) by any suitable means; but the following mode of attaching it is preferred, which will be understood by reference to figs. 7, 8, and 9, and to the dotted part of fig. 1:—The two parts 4, 4, fig. 8, are firmly fastened to the under part of the carriage, or to a piece of timber supported by, and suitably attached to, the axles of the carriage; in the under part of these supports is formed a groove or slot 5, 5, and upon the rack are fixed suitable projections 6, 6, through which bolts 7, 7, are passed, going also through the slot in the support. These bolts 7, 7, resting at the bottom of the slots, support the rack in the horizontal position shewn; a little lateral movement being allowed. By this arrangement, if the rack met with a sudden resistance from any of the pinions in passing them (the momentum of the carriage urging it on), it would rise to the extent allowed by the slots, and thereby getting above the pinions would be enabled to pass the obstruction, without concussion to any part of the apparatus outside the tube.

The following is another arrangement and modification of this method of propulsion, in which the piston-rack is connected to the top edge of the piston, and the pinions are brought much closer together, consequently both the piston-rack and carriage-rack are much narrower, lighter, and stronger. The tube or main in this arrangement has a square hollow channel or passage formed or cast on its upper

part, as shewn in section at *a*, fig. 16, and running its entire length, having an opening or slit of communication *b*, between the square channel and the interior of the main *c*. As before described, this tube is to have pinions, like the first-described plan, at intervals of twenty or thirty feet; but they do not reach lower than the square hollow upon the tube, and are fixed and enclosed, as will be clearly seen by referring to figs. 13, 14, and 15. The tube will be formed, as usual, of lengths of pipe, connected together by socket-joints and cement; except that it is proposed to cast upon one end of a certain number of these lengths a more solid portion, which will form one-half of the enclosure for a pair of pinions, with their supports, &c. Through this more solid part the square channel and the main passage pass, as through the other portions, and in it two recesses *d*, *d*, are made, for the reception of the lower pinions, as shewn; it has also bearing holes at *e*, *e*, for the lower pivots to work in, (but deeper than the pivots are long, that the pinions may rest upon the shoulders at *f*, *f*,) and a passage to permit the spindles of the pinions to pass through at *f*, *f*; and also supports *g*, *g*, with bearing-holes for the upper pivots, as at *h*, *h*. It will be understood, that one-half of each recess *d*, *d*, is formed on the end of one length of tube, and the other half on the adjoining length, the joint being situated at the dotted lines 5, 6, figs. 13, and 15, so that when two are brought together they will form a complete whole, and enclose the lower pinions, as desired; the parts being bolted together by screw-bolts *i*, *i*, fig. 15, and made air-tight by cement, or by a little packing. All the other joints of the main may be the common socket-joint; and there should be one or two such joints between every two of these pinion-joints; when, if each length of pipe be ten feet, the pinions will be situated twenty or thirty feet apart.

It will be seen, then, that the lower pinions are not to enter the tube at all, but to project in a similar manner into the square passage above, as at *k*, fig. 14; and therefore the pinions (both top and bottom) will be much nearer to each other than in the first-described plan. A sufficient space is to be left at *d*, *d*, and *l*, *l*, to allow of the pinions being raised, and the holes through which the axes pass, as at *f*, *f*, are to

to be made somewhat larger, so that when the shoulder or conical seats are lifted up, a free passage may be made for the ingress of the air into the tube. Under the upper pinions the spindle is made conical at *m*; and between each pair of pinions are fixed, by hinges on the top of the pinion chamber, two pieces of iron *n*, *n*, which are so made and arranged that their centre of gravity will be on the side nearest each other, so causing them to fall and touch together at the top, and having a stop at the bottom near the joint at *o*, to prevent either of them falling past the centre of the tube. These jointed pieces, or guides, have liberty of movement backwards or towards the pinions, so that if any substance be forced in between them they will separate, and their upper ends would be pressed against the conical part *m*, *m*, of the spindles, and would therefore raise up the pinion, as shewn by the dotted lines in fig. 14; the part *p*, being a sectional representation of the carriage-rack between the pinions. These guides *n*, *n*, serve two purposes,—they project, diverging from each other, on either side of the pinions, thereby forming guides for the entrance of the point of the carriage-rack between the pinions; and also by being pressed back by the rack, they will lift the pinions up, and allow the air to rush into the tube behind the piston.

The following is the mode of constructing the piston, which is represented in section at fig. 13:—Upon a strong iron bar *r*, having shoulders and screws at each end, several discs of iron, wood, and leather, are placed, in the order represented. The disc *s*, is formed of iron, having a hole through the centre to fit the smaller part of the bar *r*, and to go close to the shoulder: this disc is made at its extreme edge or point of the same diameter as the interior of the tube, or nearly so. Next to this is a disc of thick leather, or other suitable material *t*, of rather larger diameter. In front of this is another disc of iron, *u*, formed of the shape shewn in section, that is, dished or concave on the inner side, to correspond with the convexity of the disc *s*; and the disc *u*, being placed upon the bar, and pressed up, will cause the leather or other material *t*, to take the form shewn: this disc will be of nearly the same diameter as the interior of the tube. In front of the

disc *u*, a conical block of wood *v*, is placed, and these several pieces being screwed up together by the nut *w*, will form the one part of the piston: the leather expanding against the inside of the tube, and rendering it air-tight, or nearly so. At the other end of the bar the same arrangement is repeated, in the manner shewn, making a double piston. (In the piston of the former plan, as represented at figs. 2, and 3, the leathers and discs are so arranged as to form, and only occupy the space of a cog of the rack, so being capable of passing the projecting pinions in the main; this arrangement of parts and general form is shewn at *l*, *l*, where there are intended to be four leathers to the complete piston, and two bars and nuts to keep them all steady together; but the patentee prefers the plan just described.)

The manner of forming the piston-rack, and attaching it to the piston, is as follows :—A rod of iron or steel is provided, of suitable strength, and rather longer than the space between two pairs of the pinions on the main tube, so that it may be between or in contact with one pair before leaving the other. This rod has a strong eye formed at one end, and bent down as shewn at *x*, fig. 13, and the eye is placed upon the end of the bar *r*, and held firmly against the wooden cone *v*, by the nut *w*; the principal part of the rod itself passes up through the slit or opening, and is situated in the square channel that runs along the top of the main tube. Upon the rod are placed a number of pieces of iron, wood, and caoutchouc, or other material, (to fill up its entire length) of the shape shewn at figs. 17, each having a hole through it the size of the steel rod; and when placed regularly against each other, as represented at figs. 18, and 19, they will form a double line of cogs, being made the proper size and shape to match with the pinions. When a sufficient number of these are placed upon the rod to make the required length, they are all secured on, and kept up tightly together, by a nut, screwed on to the extreme end of the rod, which then forms the "piston-rack;" and the same being very nearly the size of the square channel on the main, will pass along, when dragged by the piston, and come into contact and gear with the lower pinions as it passes between them. The first few cogs, say six, at the end *y*, fig.

13, are made of caoutchouc, or other elastic and tough material, to prevent concussion, &c., and are rather larger than the others, so that they nearly fill the square channel, thus making it partially air-tight, and forming, as it were, a piston to this channel. The first one or two cogs should have a part projecting downwards through the slit, as at *y*, to fill up the slit, and rest upon the top of the piston; the same may be repeated over the hinder part of the piston at *z*. Next to these six elastic cogs, about nine cogs of tough wood are placed, and then the rest of the rod is filled up with iron ones, unless wood should be found preferable.

The manner of forming the carriage-rack for this plan is represented at figs. 20, and 21; fig. 20, being a side view of a portion of it, and fig. 21, a top view. 1, is a plate or thin bar of iron, of suitable width and thickness, pointed and rounded at its ends, and being of the same length as the piston-rack. On each side of this plate are to be riveted pieces of iron, or other suitable material, in the form of cogs, as shewn at 2, 2, at equal and proper distances apart, to correspond with the pinions: the rivets are represented by the dotted lines at 2, 2, as running through and fastening two opposite cogs at once. This carriage-rack may be attached to the under part of the railway carriage or axles, in a similar manner to that before described. By a simple arrangement, the guard or brakesman may have power, at will, in an emergency, of lifting this rack out of gear, and thus disconnecting the train from the influence of the motive power.

The figs. 13, and 20, shew the intended relative situation of the piston-rack and carriage-rack, the piston being a little in advance of the latter. If desired, every carriage in a train behind the first one may have a suitable bar of wood, attached in a similar manner as the rack is upon the first carriage, to act like it upon the guides, and to keep the pinions raised up a longer time, thereby allowing a greater body of air to rush into the tube behind the piston.

This method of propulsion may be further modified, by substituting ropes, bands of leather, or other material, in place of the racks as described, varying the surface accordingly.

The operation of this invention, or manner of its working,

is as follows:—A pipe or tube, as before described, of sufficient diameter, being laid along in a hollow between the rails of a railway, and being exhausted of air by suitable means, and having the pinions arranged, as described, at intervals throughout its length, the piston, with its rack attached, is placed in this tube, in the manner before explained, at the farther end from whence the air has been, or is being, exhausted or withdrawn; the piston-rack being in gear with the lower pinions, or those inside the tube. A railway carriage, having a carriage-rack attached to it, as described, being placed upon the rails, as shewn by the dotted portion of fig. 1, and this carriage-rack being in gear with the upper pinions, or those outside the tube, the one rack cannot move backwards or forwards without the other rack moving also, at the same speed, and in the same direction; and thus as the piston is forced onward in the tube by the pressure of the atmosphere, the carriage will be caused to accompany it.

As it is necessary that the atmosphere should be admitted as nearly behind the piston as possible, the pinions are lifted up by the advance of the piston-rack in the *first* plan, and by the carriage-rack in the *second* plan, as described before; and the air will enter through the space caused by the rising of the conical or flat portion of the arbor or axis of the pinion, as described; thus there would always be at least two or more such passages open, as the rack acts upon the one before it leaves the other. After the rack has passed onward, the pinions, by their own weight, fall into their place, and thus make an air-tight tube, ready for the next exhaustion; when, if an air-pump be set at work at the other end, and the direction of the piston and rack changed, and placed again, as before, into proper gear, the carriage would return in like manner.

Fig. 22, is a plan or bird's-eye view of a portion of an atmospheric railway (constructed according to this invention,) crossed, on a level, by a roadway, and by another line of atmospheric railway; and fig. 23, is a longitudinal elevation and section of such an arrangement, by which it will be seen that there is plenty of space between the pairs of pinions for the crossing; and that the mains being sunk beneath the surface

of the ground, or under the sleepers of the rails, they are entirely out of the way; the carriage-rack passing on from one pinion to another over such roads, without interfering. Where it may happen that two tubes are required to cross each other, one will pass beneath the other, the upper one keeping its level course, while the lower one makes a gradual descent or dip under it; and the pinions keep their necessary level at the upper part, by their axles being lengthened at such a locality, as represented at *a*, fig. 23. The carriage-rack of a train is shewn advancing upon this cross line, as it would appear, just previous to its taking the pinions at *a*. Figs. 22, and 23, represent the plan first described; the other plan would differ in having the channel along the top of the main, and the pinions closer together (laterally), &c.

As there will not be, on this plan, even in a single line of rails, any discontinuance of the main tube, but at a place arranged for trains to meet and cross, which will always be at a station, (and, for general purposes, not less than twenty miles apart), it will be only at such places that the main tube will require any kind of valve to close its open end. Fig. 24, represents such a crossing; *a*, and *b*, are the mains, connected with the air-pumps by pipes under ground, as at *c*, *c*; the engine, air-pumps, &c. are situated at *d*; the mains are discontinued at *e*, and *f*, and the rails made to take the direction shewn in the drawing, so that the trains arriving here would each take one of the sidings, *g*, or *h*, and thus pass each other. The end of the main would simply require a disc of iron or wood to be placed against the open end, with a little composition to make an air-tight joint, when the vacuum is to be made by the air-pump at *d*; which disc or valve will fall, or be pushed aside, when the piston arrives at the end, and will require no more attention, excepting being replaced or closed by the time that the engine *d*, is again required to work.

The piston would, when it arrives here, either partially or wholly leave the tube, after displacing the disc or door at *e*, or *f*, by its remaining momentum, and the train, with the carriage-rack, would pass on, and take one of the sidings *g*, or *h*, and be stopped by the attendants by brakes, as usual; but the operation of the stopping would have been begun

before arriving here; the train now only moving slowly, and with sufficient momentum to carry it to the place required, or middle of the siding. When the piston, with its rack, reaches the end of the main, and is withdrawn therefrom, it is received by a trough, mounted upon four wheels or rollers, and is removed for inspection, &c., and another piston, newly greased, &c., is brought and placed (by the same means), with its head in the tube, ready for the next returning train. The trains having both arrived, each train would be (by any suitable means), urged on to the commencement of the opposite main, where the fresh pistons having been already inserted (and held by any convenient contrivance), and the vacuum formed, the carriage-rack coming into gear with the first pair of pinions, near *e*, or *f*, and the piston released, the train would start on its journey. Thus the pistons would never leave the main, or enter another, but at a very slow pace, and at a place for stopping. The dotted lines from *e*, to *i*, and from *f*, to *j*, represent the continuance of the hollow or channel in the ground, turning to one side, under the rails, and ascending to the surface level. By these hollows the pistons may be readily got at and removed and replaced at pleasure. Several other arrangements might be adopted for the foregoing purposes.

The pinions situated near the crossing stations should not be lifted up for the admission of air, as the others, and therefore they would not require the apparatus or parts *n*, *n*, figs. 13, 14, and 15, for that purpose; by this arrangement, the piston would be impelled with less force, for as the air would not continue to enter behind it, that which is in would be rarified or attenuated; and thus not only would the speed be checked, but so much would be done towards the next exhaustion which is immediately to be made, (if a valve were introduced to shut off for this purpose), thus economising time and power.

When this method of propulsion is used upon common roads, the tube is to be sunk or buried along the side or centre of the road, and its operation will be the same as before described.

When used as a means of propulsion upon rivers or canals, the tube may be smaller, and laid either at the edge of the water, or upon piles or posts along its centre; the rack being

affixed to the bows or side of the vessel to be propelled, to which may be attached any others that are intended to be drawn with it, thus making as it were a train of vessels: the general operation, in other respects, will be the same as described for carriages upon railways.

The patentee also proposes to lay down along the line of railway a small tube or tubes, such as are used for gas, about half an inch diameter in the bore, and put together air-tight; these tubes are to terminate in any suitable place at each station, by having their ends brought up and bent round, with a portion of glass tube fitted on, and that made to dip into a vessel containing mercury. Near the end or part where the glass portion is affixed, there is to be a branch pipe, leading to a receiver or air-tight vessel, and furnished with a cock or valve, so that a communication can be made or shut off at pleasure between the receiver and the long tube; and the receiver is to be connected with the air-pump by a pipe or valve, so that a vacuum could always be easily procured and maintained in the receiver. Fig. 25, represents such an apparatus; *a, a,* being pipes leading to the next station Y, and *b, b,* the branch pipes, leading from the pipes or tubes *a, a,* to the exhausted receiver. *c, c,* are the cocks, and *d, d,* the glass portions dipping into the mercury contained in the vessel *e*; these glass parts are called "indicators," as each of them will shew if the mercury rise within it, which will be the case if the air in the tube, connected with either, be rarified, by opening the cock or communication between it and the receiver at the other station, within which is to be preserved a vacuum, or nearly so. The operation of, or manner of using, this apparatus, which is termed the "pneumatic telegraph," is simply for a person to make the communication between the vacuous receiver and the tube at a station Z, when almost at the same instant the information would be indicated at the station Y, (whither the tube is carried,) by the mercury rising in the glass portion, as shewn at *f*, so that if one or more of these tubes were laid from station to station, and any particular meaning agreed upon for the action or rising of the mercury of any one or more tubes, as "stop," and "go on," in fig. 25, a signal can be conveyed as to the stopping

or setting on of the engine, &c. &c., (for which use it is intended). The tube may be attached to the sleepers along the line, or buried. Two tubes are considered all that would be necessary upon an atmospheric railway, one to indicate, by its action, "stop," the other, "go on." These tubes could be so made as to permit of their being acted upon in any part of the line between the stations, by having places where a pipe could be attached, and a vacuous vessel carried by the train having a pipe to fit on, &c. If preferable or necessary, a small float, connected with an alarum or bell, may be inserted in the mercury at the foot of the glass tube (when it would be necessary for each tube to have a separate vessel); the rising of the mercury in the tube would lower it in the small vessel, and thus the float sinking, might be made to act upon the detent of the alarum, and so enable it to give notice by a sound, or strike upon a bell, in case of the person not looking at the indicator.

Although the patentee considers that the pneumatic telegraph may be used with advantage, he lays no claim thereto; neither does he claim the propulsion of carriages or vessels by atmospheric pressure acting on a piston through a continuous tube, except as hereafter mentioned. He claims, First,—the arrangement and application of air-tight spindles and pinions, or plain rollers, applied to the main tube, and in combination with a piston travelling by atmospheric pressure, for the propulsion of carriages and vessels, as above described. And, Secondly,—the arrangement and application, on the main tube, of spindles, having a flat, cupped, or conical seat, acting as valves, in combination with a piston travelling by atmospheric pressure, for the propulsion of carriages and vessels, as above described.—[*Inrolled in the Inrolment Office, November,* 1844.]

To William Jenkinson, *of Salford, in the county of Lancaster, machine-maker, for certain improvements in machinery or apparatus for preparing and spinning flax, and other fibrous substances.*—[Sealed 31st March, 1841.]

These improvements in machinery or apparatus for preparing

and spinning flax, and other fibrous substances, apply particularly to the spinning of flax, silk, wool, and such other fibrous substances as have a long staple or fibre, and especially to spinning or producing fine "numbers," or threads, or yarns, of very fine or delicate quality; and consist, Firstly,—in making certain alterations in the construction and arrangement of the ordinary machinery or apparatus, now commonly called the "mule," and used or employed for spinning the finest qualities of yarn, made from cotton; and, Secondly,—in the application of such machinery to the spinning of flax, silk, wool, or other fibrous substances of long staple. Such fibrous substances or materials, above mentioned, have hitherto been spun either by hand, or by that description of machinery called the "throstle." The yarn or thread has been spun and wound upon bobbins, running loosely upon spindles, having flyers or guiders attached, in order to conduct the yarn on to the bobbins. This kind of machinery (the throstle-frame), is not only very expensive, but is not calculated to spin very soft, tender, or very fine yarn, on account of the "drag" which is required for the bobbin, and also of the sharp angles to which the yarn is subjected in passing through the flyer to the bobbins. Now the present invention consists in the application of the draught or drawing-rollers, (with their ordinary gearing and apparatus, and with certain alterations made therein), hitherto used only on the throstle-frame, to machines made upon the mule principle, that is, such machines as are now in use, and well known, for spinning or producing the finest number or qualities of yarn made from cotton; the carriage, with the spindles, being caused to recede or run out from the drawing-rollers, as they deliver the yarn, and when a certain length has been delivered, and has received the quantity of twist required, the carriage is then forced back again, at the same time the yarn is wound upon the spindles in the form of a cop, which latter processes may be performed by hand, or made self-acting.

In Plate V., are shewn three several sets, or arrangements of draught-rollers, to be applied to the roller-beam of the ordinary mule, and to be employed for spinning silk, wool, and flax; *a, a, a, a,* being the several drawing, carrying, and holding

rollers, mounted in carriers or bearings *b, b, b*, and attached or applied to the ordinary roller-beam *c, c*, of the mule. These three figures, or views of the improved application of the draught rollers to the common cotton mule, will be well understood by an inspection of the drawings, and require no further explanation. The precise arrangement, numbers, or diameters of the draught rollers, and the material of which they are composed, must, of course, be varied to suit the substances and length of staple to be spun, exactly in the same manner as hitherto done, and which is well understood by the practical spinner.

The patentee remarks, that when water is used in the spinning process, it is necessary to clothe or cover the spindle with a thin tube of copper, paper, or other material, to prevent the rust or corrosion from the spindle injuring the yarn.

He claims the application of the draught rollers (as hereinbefore described), to the machinery or apparatus called the "mule," so as to constitute a new spinning or roving machine, for those fibrous substances of long staple or fibre which have hitherto been spun, either by hand, or upon the "throstle" principle; and also the application of the same to the machines to be used as roving machines, by the substitution of machines, known by the name of "stretching frames," for those called "bobbin and fly frames," in the spinning of cotton.—[*Inrolled in the Petty Bag Office, September,* 1841.]

Specification drawn by Messrs. Newton and Son.

To William Wood, *of High Holborn, in the county of Middlesex, manufacturer, for improvements in printing, dyeing, staining, or producing marks or patterns in or upon woven, felted, or other fabrics.*—[Sealed 7th December, 1844.]

These improvements apply principally to printing or staining fabrics of the carpet kind, whether manufactured by the known processes of weaving, or felting, or other means; the object being to communicate to, or deposit upon, these and

the like fabrics such copious supplies or quantities of dyeing material as will be sufficient to penetrate deeply into the fabric, in order to dye or stain it through or down to the ground-work, or nearly so: the ordinary modes of printing being, in general, only capable of coloring the surface, or a very little way below the surface. By this improved means the patentee states, that he is enabled to print or stain fabrics which have a raised terry, pile, or nap, such as the fabrics commonly called or known by the denominations, Brussels carpeting, or Wilton carpeting, and the like; or thick fabrics without pile, such as Kidderminster carpeting, and druggets.

In carrying out this object, a series of cells or compartments are provided, capable of holding a considerable quantity of the dyeing or staining matter. These cells or compartments may be arranged, either upon a level or a curved surface, in any figures or devices capable of producing patterns. The cells are divided by partitions, in order to limit and define, laterally, the flow of the dyeing or staining materials; the several colors employed being placed in separate cells according to the desired colors of the pattern to be produced. These arrangements being made, the face of the fabric is brought into contact with the open parts of the cells, and caused to dip or penetrate into the cells, for the purpose of taking up such quantities of the coloring matter as will suffice to dye or stain those parts of the fabric operated upon to the depth required.

The patentee has shewn several modes of adapting these elementary principles to the purpose of printing, dyeing, or staining patterns on the said fabrics, which are described as follows:—In the first place a flat plate or surface (to be made of metal) is provided; upon this plate narrow strips or ribs of metal are set upright and arranged into figures or forms, agreeable to any required pattern. These are soldered or otherwise attached to the plate, so as to constitute separate cells or receptacles for the coloring matter, the upper edges of the strips being all level or coincident, so as to produce an even surface.

In Plate V., fig. 1, represents a portion of a flat plate

A, A, A, having the elevated ribs, strips, or partitions *a, a, a,* of thin metal set up on its surface, by which the cells, to hold the coloring matter to produce the pattern, are formed. B, B, B, is a continuous cell, formed to the desired figure, containing, say a pale green color, which is supplied through a flat pipe *b*, from a pan or reservoir (at the side of the table, but not shewn in the drawing); and when the first cell B, B, B, has become filled, the color flows from thence by other communicating pipes *b**, *b**, to corresponding cells B*, intended to form similar parts of the pattern at other parts of the plate. The cell C, C, C, is for producing another shade and portion of the figure; it contains, say a dark green color, which is conducted into it, in the way before explained, by the pipe *c*, and passed thence by the pipes *c**, *c**, to other parts of the pattern C*. The cell D, containing, say a brown color, is supplied, by the like means, through the pipe *d*, and that color is conducted forward by the pipe *d**, to the cell D*. The ground color, say ruby, intended to cover the main part of the fabric, is made to flow over the surface of the plate A, A, A, and over the before-mentioned feeding-pipes, as shewn in the drawing, and is confined within the marginal ribs E, E, E, on the outside. This apparatus being so prepared, the face of the fabric to be printed or stained is brought over and pressed upon the upper surface of the partitions *a, a, a,* on the plate A, A, A, by a flat platten, as in the ordinary way of type-printing; by which means certain parts of the surface of the fabric are forced into the cells or recesses containing the coloring matter, and it thereby becomes stained or dyed with the several colors in those parts where the pattern is intended to be produced.

Fig. 2, represents an elevation, partly in section, of a press, well calculated for the purpose of printing or staining fabrics of the kind described, by means of the improved apparatus, viz., a plate with cells, as shewn at fig. 1. This press the patentee does not intend to claim as new, but shew it merely for the purpose of explaining his mode of printing or staining more perfectly. The cloth or fabric *a, a, a,* to be printed, is wound upon the roller *b*, and thence conducted under the roller *c*, in a horizontal direction, to the rollers *d*, passing,

face downwards, over the dyeing-plate A, A, before described, which plate is laid upon the table of the press. The table, whereon the plate A, rests, is heated by a steam-chest B, below, of which indeed the table may be said to form the upper part. The cells of the plate A, A, being filled with colors, by the means described, or by any other means that may be found eligible, that portion of the distended fabric *a, a,* which is stretched over the face of the plate A, A, is pressed upon the upper surfaces of the partitions, and the parts intended to be printed are made to dip into the cells of the plate by the descent of the platten C, and having remained there a sufficient time to take up the necessary quantity of color or dyeing material, the platten is raised and the cloth drawn onward. In the progress of the cloth toward the taking-up roller *e,* it passes over a hot plate D, for the purpose of drying the color. This plate may be conveniently heated by the flame of jets issuing from a gas-pipe E, though it may be done by other means; and, indeed, it may not always be necessary to dry the coloring matter upon the fabric in this part of the operation.

Having explained the construction of the improved plate, with cells capable of printing four colors at one operation, and the manner of applying it in a press to the purpose of printing or staining fabrics, the patentee proceeds to shew a modification of the apparatus, by which a great variety of colors may be printed upon the fabric at one time.

Fig. 3, represents a series of angular tubes *a, b,* &c., connected together, side by side, in close contact, by solder or other convenient means; and fig. 4, is a vertical section of the same; the top surfaces of these conjoined tubes form together a flat surface, equivalent to the plate first described. Upon this flat surface, strips or ribs of metal are arranged, as before, in such curved or other shapes as will correspond with the outlines of the pattern intended to be printed, in order to produce distinct cells or receptacles for the coloring matter, the strips or ribs forming the partitions between the cells. The colors or coloring matters, in a fluid state, are supplied to this apparatus from pans or reservoirs on the sides, from whence the several coloring fluids will pass into the pipes

a, *b*, &c., and rise through small openings from the several horizontal pipes into the several recesses or compartments. Care must, however, be taken that the coloring matters do not overflow from one compartment into an adjoining compartment, for, if that occurred, the patterns would become ill-defined and confused; but this defect is prevented by keeping the surface of the coloring material in the pan at the same level as in the recesses.

The surface of fig. 3, it will be seen, is divided into cells A, A, B, B, &c., by the ribs or strips of metal; it will, therefore, merely be necessary to say, that the lateral trough A*, being supplied with a red coloring matter or dye, that color will flow through the communicating pipes *a*, *a*, *a*, to the several cells or compartments A, intended to contain the red liquor; and the cells B, B, will, in the same manner, be supplied with a slate color from the lateral trough B*, through the pipes *b*, *b*, *b*. All the other compartments will be supplied by similar means with their respective colors, from lateral troughs through pipes; each of which pipes has a small aperture, or apertures, through which the liquor flows upwards to the several compartments.

Another mode of constructing cells to contain the coloring liquors is, by forming pipes or hollow tubes in small pieces, about the size and shape of printing types, which may be combined into figures by the ordinary means of composition: hollow types being employed for forming the cells, and solid types for the blank parts of the pattern. These types having been composed into the desired figure, may be placed over a trough containing the coloring liquor, and the cloth being laid thereon, the liquor may be forced up through the hollow types into the fabric by any convenient means. A convenient mode of applying these hollow types is shewn at figs. 5, and 6. Fig. 5, is a horizontal view of a form of these types set up to represent a diamond pattern, the types being circumscribed, and held fast by a frame or chase A, A, A. The tinted squares represent the hollow types, through which the coloring matter is forced on to the fabric, and the other parts are solids or blanks. Fig. 6, is a vertical section of the same. The frame A, A, A, is a box, in the mouth of which the types are inserted

and made fast. Within this box a vessel B, is attached, intended to contain the dyeing or staining material in a semi-fluid state; the sides of the vessel being formed of a flexible material. When the form of type has been placed upon the fabric to be printed in the usual way of applying blocks for printing, the moveable top of the vessel B, is to be slightly depressed, for the purpose of forcing a quantity of the dyeing or coloring matter through the hollow types on to the fabric. Another mode of adapting these hollow types to the purpose of dyeing or staining fabrics is shewn at fig. 7. This consists of a hollow cylinder A, perforated with small holes, into which the smaller ends of types are to be inserted; the whole periphery of the cylinder being covered with types set radially. Agreeable to the pattern or device to be printed, the hollow types are inserted at certain parts of the cylinder, and when the interior of the cylinder is charged with the coloring material, the cloth or fabric passing under the hollow types will be printed. The coloring matter being of such a consistency as will only fill the hollow types, but not flow freely through them, a volume of steam, at a slight degree of pressure, is conducted through the central axle, in order that it may fill the chamber or passage B, which extends the whole length of the cylinder; by which pressure of the steam the coloring matter will be forced through those hollow types which are in contact with the cloth below, and dye or stain it accordingly.

Fig. 8, represents in sectional elevation, an improved apparatus, whereby a rotary surface-printing cylinder is applied to the printing of woven and other fabrics; *a, a,* is the printing cylinder; and *b*, a roller, mounted and revolving in the color trough *c*, for taking up and depositing color upon the surface of the cylinder. The raised parts or surfaces of the patterns on this cylinder are perforated, as shewn at *d, d, d,* and when the pattern has been supplied with color from the roller *b*, and by the revolution of the cylinder *a*, is brought under the steam passage or chamber *e*, similar to that above described in fig. 7, the steam will enter the perforations, and force out the color on to the fabric, while, at the same time, the pressure of the cylinder on the fabric will cause the color on the solid parts of the pattern to be taken off. The perforations may,

if thought desirable, be covered with woollen cloth, or other porous material.

The patentee claims, Firstly,—the employment of a series of cells or recesses, capable of containing dyeing, coloring, or staining materials, and formed to the shapes or configurations of the patterns or devices required to be printed upon the fabric, when brought into contact with them. Secondly,—the employment of hollow or perforated tubes or types, capable of being composed or set up into forms or patterns, in frames, or inserted in perforated boxes, or hollow cylinders, by means of which coloring matters may be deposited upon fabrics. Thirdly,—the employment of perforated surfaces, through which coloring matters might be expressed to produce patterns upon the face of a fabric. And, Lastly,—the employment of steam or pneumatic pressure, passed through perforated blocks or surfaces, for the purpose of assisting the deposition of coloring matters in the operations of printing or staining fabrics.—[*Inrolled in the Petty Bag Office, June,* 1845.]

Specification drawn by Messrs. Newton and Son.

To John James Osborne, *of Macclesfield, in the county of Chester, gentleman, for an invention of certain improvements in the manufacture of iron and steel, and in the furnaces to be employed for such or similar manufactures,—being a communication.*—[Sealed 16th January, 1845.]

The first part of these improvements consists in a peculiar mode of treating pig or cast iron, by the admixture of a certain composition to be added to it; when in a melted state; and the second part of the improvements consists in the novel application of a peculiar furnace for refining and making cast steel.

The mode of accomplishing the first part of the improvements is as follows:—If it be merely desired to improve the quality of the iron, add to an ordinary charge (say three or four hundred weight of pig iron) in a puddling furnace, when the same is fully melted, a mixture composed of two pounds of common salt, two pounds of fresh burnt or quick lime, in powder, and fifteen pounds of iron scabs or slag, from the forge, commonly known as hammer scab or hammer slag;

these ingredients being previously well mixed together are to be introduced into the furnace by means of an iron spoon or ladle, in small quantities at a time, stirring into the melted mass each successive portion; the iron is then to be puddled, and treated in the usual way when making bar iron, and will be found to be materially improved in quality. For making shear steel, the mode of operation is as follows:—To a charge of five hundred weight of pig iron, melted at a white heat, twenty pounds of hammer scab or slag is added, when the whole is in a liquid state; to this is subsequently added six pounds of a mixture, composed as follows:—two pounds of common salt, two pounds of quick lime, in powder, and two pounds of pearl-ash, or four pounds of the common carbonate of soda, but the former is preferred. The ingredients being thoroughly mixed, and added in small quantities, as before described, a violent effervescence ensues, and carbonic acid gas is discharged. The mass, after being properly worked, is made into balls, hammered and rolled in the ordinary way of making shear steel. When it is required to produce cast steel, the mass is treated in the same way as regards the mixture, but not puddled or balled, or a wind or blast furnace may be employed. The charge being "tapped," or run out of the furnace in a melted state, into a suitable bed for making a plate of about one and a half inch thickness, the "cinder" or slag will rise to the surface, and being cooled by sprinkling with water, may be easily separated when cold. The plate is then to be broken up, and re-melted in crucibles or melting pots, in a wind or blast furnace, in the following manner:—Twenty-eight pounds of the plate, obtained as before described, is put into a crucible, with one and a half pounds of green bottle glass, eight ounces of pearl-ash, or sixteen ounces of carbonate of soda (but the former is preferred) and eight ounces of the black oxide of manganese. The whole being well melted together is stirred up with a clean iron rod, and the slag removed; when it is cast into ingot moulds, in the usual way, and will be found converted into excellent cast steel.

The second part of the invention consists in the application and employment of a peculiar blast furnace, for performing

the last operation, which will be found to possess several advantages, as the process is much shortened thereby, and a better steel results than when melted in an ordinary wind furnace, and the pots or crucibles are much less liable to crack by the action of cold air through the fire bars.

In Plate VI., fig. 1, represents in sectional elevation two furnaces, constructed and arranged according to this invention. A, is the body of the furnace, formed of an iron pot, two feet six inches in height, and three feet in diameter, furnished with eight holes, C, to admit the blast, four being about six inches from the bottom, and four being half way up the side, the upper holes being pierced at equal distances between the spaces of the lower ones, to secure a more equal distribution of the blast. These pots are lined with a proper thickness, (about four inches,) of refractory fire clay, or any suitable substance for resisting the heat. B, is a stand for supporting the crucible, about twelve inches high, formed of fire-brick. These pots are placed within four square iron plates, two feet six inches high, and three feet eight inches in breadth, bolted together and cemented, so as to form with the circular plate at the top an air-tight chamber, with a clear space of about three inches round the pot; the blast being admitted into the outer case by two or more openings. The space D, thus acts as an air chamber, and distributes the blast through the openings C, to the pot or furnace, in a regular and equable manner, causing a greater equality of temperature than could be obtained by means of one or two openings. Now it is obvious that these furnaces may be made of a size to contain two or more crucibles, as shewn at fig. 2. They may also be made square, rectangular, eliptical, or of any other suitable form, for carrying out the principle of these improvements; but the circular form and size herein-mentioned is preferred, as being most easily managed, and most economical in use. The furnace is charged with hard cokes, as in an ironfounder's cupola, and the blast supplied by a suitable blowing-machine. Two furnaces are here shewn, to exhibit the mode of joining them; thus any required number may be constructed in a comparatively small space, and the furnaces being small, a soft blast will raise quickly a very high temperature, and it is

obvious, that furnaces may be used advantageously for refining and melting cast steel in crucibles, though made by the old and known process, as well as by the new mode herein described. In constructing them it will be found advantageous to sink the mouth or top of the furnace to the ground level, as in ordinary pot furnaces, in order to give the workmen a greater command over the crucible.

The patentee states that he does not claim the ingredients herein described, separately, nor does he restrict his claims to the exact proportions here recommended, as they may be considerably varied with a beneficial result; but the proportions are given which will be found in practice most economical, beneficial, and best calculated to produce the result herein described. He therefore claims, Firstly,—the use and application of the mixtures or compositions, according to the mode herein set forth and described, so long as the principle of the invention is preserved. Secondly,—the use and application of the blast furnace, for melting and refining steel, according to the modes shewn and described; whether the same be constructed of iron, brick, or stone, or any other suitable materials, so long as the principle of working with a close air chamber, in the manufacture of iron and steel, to soften and diffuse the blast, is pursued.—[*Inrolled in the Petty Bag Office, July,* 1845.]

Specification drawn by Messrs. Newton and Son.

To JOHN CLAY, *of Edgely, Cheshire, corn-dealer, for an improved apparatus for consuming smoke.*—[Sealed 23rd January, 1845.]

THE object of this invention is to effect the combustion of the smoke produced in steam-boiler and similar furnaces; it consists chiefly in causing the smoke and gases to pass through openings in an arch or surface, interposed between the fire-bars of the furnace and the surface to be heated.

The drawing in Plate VI., represents a longitudinal section of a steam-boiler furnace, constructed in the manner proposed by the patentee, in order to consume the smoke. Imme-

diately beneath the boiler is an arch of fire-brick *a,* formed with a series of slits or openings *b,* for the passage of the smoke, heated air, and flame, from the furnace to the bottom of the boiler: the crown of this arch has a regular inclination, so as to recede from the bottom of the boiler as it recedes from the front of the furnace. At the back of the furnace is a chamber *c,* into which air can be admitted occasionally, by means of two flues *d*; the outer ends of these flues are closed, when required, by sliding doors *e*; and at the back of the chamber there is a door *f,* for the purpose of cleaning out the chamber. The air passes from the chamber *c,* through openings *g,* in its sides, to the inner surface of the arch *a*; but the course of the heated air may be varied, by forming openings in the roof of the chamber, as represented by dotted lines at *h.* The fire-bars *i,* are mounted in suitable bearings, and have each a small worm pinion on their front ends, gearing into a corresponding number of worms on a shaft *j,* which extends across the front of the furnace, and is caused to revolve slowly by any suitable means; thus each bar partakes of a slow revolution, and so prevents the fire from becoming dull at any particular part, or clinkers from forming, to impede the current of air to the ignited fuel. The doors *k,* of the furnace, are formed with a double casing, and perforated to admit the air.

The patentee states that the above wire-drawing, or passing the smoke through the contracted openings in the heated arch *a,* causes the carbonaceous portion of the smoke to be consumed; which consumption is accelerated, when required, by the admission of heated air from the chamber *c*; and the gases evolved after the carbonaceous portion of the smoke is consumed, proceed by the flue *l,* under the boiler, to the chimney.

The patentee does not confine himself to the exact arrangement above set forth, but claims all modifications thereof; the characteristic of his invention being, the passing of the smoke and gases evolved from the furnace through a contracted space of heated surface, placed between the furnace and the surface to be heated; with or without the admission of air, as above described; and he also claims the continuous

or occasional revolutions of the fire-bars, as above described. —[*Inrolled in the Inrolment Office, July,* 1845.]

To James Tarver, *of Daventry, in the county of Northampton, ironfounder, for improvements in machinery or apparatus for cutting, grinding, and dressing vegetable substances.*—[Sealed 21st January, 1845.]

The improved machinery or apparatus for cutting, grinding, and dressing vegetable substances, which forms the subject of this invention, is represented in Plate VI., fig. 1. being a side elevation, with the grinding part of the apparatus in section; fig. 2, a plan view; and fig. 3, an end elevation. *a* is the fly-wheel of the machine; *b, b,* rising rollers, that move forward the straw or substances on which the machine is required to act; *c,* a helical screw or worm, which gives motion to the rollers *b, b,* by acting on the face cog-wheels *m, m,* upon the axes of those rollers; *d,* a forked guage, by which the chaff-cutting knives *l, l,* are thrown out of action: this is done when the grinding apparatus is to be put in operation. *e,* is a lever-bar, which carries at its lower extremity a weight *f,* and is used to regulate the compression of the straw or other substance. *g,* is a set screw, by which the grinding-mill is adjusted and regulated, in order to suit the action to the coarser or finer grains submitted to its operation; and *h,* a door or opening, which affords convenient access to the mill, for the purpose of cleansing or clearing it of accidental obstructions. *i,* is a cranked lever, by which the attendant who feeds the machine is enabled to assist the man employed in turning the fly-wheel; the motion of the lever being communicated to the fly-wheel shaft *o,* by means of the crank *k.* *n,* is a shifting spur-wheel which is mounted on the shaft *o,* and can be put into or out of gear with the spur-wheel *p,* on the spindle *j,* of the grinding apparatus, at pleasure, for the purpose of throwing that apparatus into or out of action. *q,* is the hopper of the mill; and *r,* the runner or cutter of the mill. *s,* is the feeding-box or trough, by which the straw or other substance to be operated upon by

the knives *l*, *l*, is advanced to the point of operation at the front of the machine.

The patentee, in conclusion, says, "I claim, as of my invention, the particular modes of arrangement, and the particular combinations of parts, together with the principles of construction, upon and according to which, such particular modes of arrangement, and such particular combinations of parts, are made, and by which the same are carried into practical effect; and I declare such the aforesaid circumstances of modes of arrangement, combinations of parts, and principles of construction, to be in the manner and in fact as I have hereinbefore specified, described, and set them forth in this my said specification and drawings thereof."—[*Inrolled in the Rolls Chapel Office, July,* 1845.]

To George Joseph Green, *of Birmingham, in the county of Warwick, manufacturer, for a certain improvement in or addition to harness or harness furniture.*—[Sealed 23rd January, 1845.]

This invention consists in the employment of an instrument or apparatus for holding the reins of a horse during the absence of the rider or driver. The instrument (which is to be attached to any convenient part of the harness, or to the carriage) consists of two arms or branches, connected together by a joint, in such a manner that their ends are capable of approaching or receding from each other. The reins are introduced between the outer or grasping ends of the arms, which are then caused to grasp them tightly, by the action of a spring, wedge, or screw.

The various methods of carrying this invention into effect are represented in Plate V., at figs. 1 to 7, inclusive; the same letters of reference being used for similar parts in all the figures. Fig. 1, is a front view, and fig. 2, an edge view of an instrument which is to be attached to the corner of the dash-board *a*, of a carriage; the arm *b*, is screwed on the dash-board, and the arm *c*, is connected thereto by the joint *d*; the reins *e*, are introduced between the ends b^1, and c^1, of

the arms; and then by the action of the spring *f*, on the part c^2, of the arm *c*, the part c^1, of that arm is made to press the reins against the arm *b*, and hold them firmly. Fig. 3, represents an instrument which is to be placed on the top of the dash-board, instead of at the side. Fig. 4, is another instrument, in which the spring is dispensed with, and the action of the arms is produced by a semi-circular wedge *g*, (an edge view of which is shewn at fig. 5;) the wedge is turned by means of a handle *h*, and its thickest portion coming behind the part c^2, of the arm *c*, forces that part outwards, and thereby causes the part c^1, to press the reins against the arm *b*. Fig. 6, shews another instrument, consisting of two arms *b*, *c*, connected by a joint *d*, and pressed together by a spring, *f*. Fig. 7, exhibits the application of this invention to saddles; the instrument for holding the reins is situated beneath the flap *i*, as indicated by the dotted lines; it may be placed on either side of the saddle, or on both sides;—the instrument preferred by the patentee for applying to saddles is similar to that represented at figs. 1, and 2, except that those parts of the arms, *b*, *c*, which grasp the reins, are placed vertically, instead of horizontally.

The patentee does not confine himself to the precise methods of carrying out his invention above described; but he claims the exclusive right to the construction and use of an instrument or apparatus for holding or securing the reins of horses, by causing the said reins to be grasped or pressed between two surfaces; whether the said pressure be produced by a spring, wedge, screw, or any other of the means by which such pressure may be produced.—[*Inrolled in the Inrolment Office, July,* 1845.]

To WILLIAM MAUGHAM, *of Newport-street, Lambeth, in the county of Surrey, chemist, for an improvement in preparing aerated water.*—[Sealed 31st January, 1843.]

THIS invention consists in preparing an aerated water, containing lime in the state of super-carbonate, or bicarbonate of lime, by passing carbonic acid gas through a solution of caustic lime in water, (the solution being under pressure

during the period it is being impregnated with the gas,) until the solution is highly charged with carbonic acid gas over and above the quantity necessary to form bicarbonate of lime, so that it will possess a sparkling property similar to soda and other aerated waters.

The mode of carrying out this invention is as follows:—A quantity of the refuse chippings, or small pieces of white Carrara marble, left by statuaries or marble masons, is placed in a crucible, perforated with a few holes, and submitted to a full red heat in a furnace. The carbonic acid is expelled from the marble by the heat, and, if the proper quality of marble has been selected, very pure caustic lime remains, which is then dissolved in cold water, in the proportion of one pound of lime to two gallons of water; an air-tight vessel being used for this purpose, to prevent the solution from absorbing carbonic acid from the atmosphere. One pint of water, at 60° Fahr., will dissolve $11\frac{6}{10}$ grains of lime; but an excess of lime is of no consequence, as it will remain undissolved, and can be used for another occasion. After the lime is added to the water, the mixture is well stirred for a few minutes, and then allowed to stand till the undissolved portions of lime subside; when clear, (although there will always be a pellicle on the surface) the solution is drawn off by a cock, placed a few inches above the undissolved lime at the bottom of the vessel, and is passed through any suitable filter, as, for instance, a layer of clean sand mixed with charcoal; after which, the filtered solution is kept in an air-tight vessel ready for use.

To obtain the aerated liquor, it is only necessary to pass the solution of lime into a strong and properly closed vessel, and charge it with carbonic acid gas under a sufficient degree of pressure. This may be effected by the machinery employed for making soda water, provided the pressure be sufficient to force in the requisite quantity of carbonic acid gas, so that the lime, which, by this operation, is at first converted into carbonate of lime, and next into bicarbonate, may be held in solution in the latter state, and that the water may be further highly charged with carbonic acid gas in excess, so as to possess the sparkling properties of an aerated water; for without a sufficient degree of pressure be used, the aerated

liquor will have a somewhat unpleasant flavour: the pressure should exceed that usually employed for making soda water. The aerated liquor is next drawn off into strong bottles, and the corks secured with wire or other suitable material.

The reason for not using other varieties of marble or limestone than that above-mentioned, is to prevent any unpleasant flavour being given to the aerated liquor, which it might derive from the impurities contained in other sorts of marble.

The patentee does not claim the manufacturing of supercarbonate or bicarbonate of lime by dissolving lime in water, through the medium of carbonic acid; but he claims the manfacturing of bicarbonate of lime from lime water under pressure, so as to obtain an excess of carbonic acid, and thus form an agreeable aerated liquor.—[*Inrolled in the Inrolment Office, July,* 1843.]

To ROBERT DAVISON, *of Brick-lane, Spitalfields, in the county of Middlesex, civil engineer, and* WILLIAM SYMINGTON, *of East Smithfield, in the county of Middlesex, civil engineer, for a method of cleansing, purifying, and sweetening casks, vats, and other vessels.*—[Sealed 2nd November, 1843.]

THE first part of this invention consists in freeing the wood of casks and similar vessels, while they are in the course of being manufactured, and in an unfinished state, from any injurious coloring or flavouring matters with which it may be impregnated, by exposing it to the action of rapid currents of hot air.

The casks or other vessels are made of green wood, which can easily be formed into staves of the desired curvature without the liability to blister, instead of using wood which has been dried by long exposure to the atmosphere. The staves and heads are put together, and bound with temporary fastenings (due allowance being made for the shrinkage which afterwards takes place); then the casks are subjected to the action of a continuous and rapid current of hot air, until the wood has exhaled its natural sap, or other aqueous particles, with which it may have been impregnated; the casks are then hooped, and finished off in the usual way.

In Plate VI., fig. 1, is a longitudinal vertical section, and fig. 2, is a horizontal section of the apparatus (taken in the line 1, 2, of fig. 1,) by which the rapid current of hot air is produced. *a*, is the furnace; *b, b*, two horizontal pipes that extend along the sides of the furnace; *c, c, c*, pipes of a horse-shoe form, which rise vertically from the pipes *b, b*, and communicate therewith; *d*, a pipe or passage for the admission of atmospheric air from a fan or other blowing apparatus into the pipes *b, b*; *e*, a passage for the exit of the heated air from the pipes, furnished with a sluice-cock *f*, to prevent the steam, when used, from passing into the hot-air pipes; and *g, g*, are nozzles, over which the casks are placed in such a manner, that the hot air will rush through them, and enter the bung-hole of the casks. The course through the pipes which the air takes, in passing to the nozzles, is shewn by the arrows.

The second part of this invention consists in freeing casks and similar vessels, which have been in use, from any mould, must, fungous impurities, or like matters, that may collect on the inner surfaces thereof, partly by means of apparatus that can be introduced into the casks without removing the heads, partly by rinsing, and partly by causing rapid currents of hot air to pass through them.

Fig. 3, is a plan view, and fig. 4, an end view of a machine to be used for freeing casks from fungous or other impurities. *a, a*, are the standards of the machine; and *b, b*, are two frames, the axes of which work in bearings at the upper ends of the standards *a, a*; the frames being caused to rotate by a band or chain, from any suitable first mover, passing around the riggers or pulleys *c, c*, on their axes. *d, d*, are inner frames or cradles, which carry the casks to be cleansed, and are mounted in the frames *b, b*; *e, e, e**, *e**, ratchets and spring levers, attached to the axes of the cradles; *f, f*, palls; *g, g, g**, *g**, levers and chains, for securing the casks on the cradles; *h, h*, catches, to hold the levers *g, g*; *i, i*, inclined planes, for causing the levers *e, e*, to act on the ratchets; and *j, j*, clutch-handles, for throwing the machine into and out of gear. Into the bung-hole of the cask a plug is inserted, having attached to it a few inches of common chain, with a

swivel in some part of its length; from this chain, three pieces of chain (shewn at fig. 5,) about three feet long, are suspended, by means of a ring; and to each of these lengths, three pieces of chain, like that shewn at fig. 6, about twelve inches long, are fastened, by means of a ring.

The following is the action of the machine:—The casks having been secured in the cradles, motion is communicated to the pulleys *c, c,* and the frames *b, b,* are thus caused to rotate with the cradles. When the ratchet *e**, and lever *e,* on the axis of each cradle, reaches the bottom part of the machine, the lever *e,* comes in contact with the inclined plane *i,* which causes it to act on the ratchet, and thereby move the cradle sideways, to the extent of one tooth of the ratchet; thus, for every revolution of the outer frame, the cradle moves sideways to the extent of one tooth of the ratchet; and the chains, meanwhile, by the numerous angular points which they present to the inner surface of the cask, detach whatever foreign substances may be adhering thereto. In some cases, the patentees use shingle, sand, or other granulated substances, in combination with the chains; or these substances may be used separately. After this cleansing has been effected, the chains are withdrawn, and the casks or barrels are well rinsed: the patentees prefer to employ, for this purpose, in the case of beer barrels, a small quantity of beer, of the same sort as that which the barrels are afterwards to contain. For spirit casks, this process may be dispensed with.

As the wood of the casks may have imbibed various noxious matters, which the above mechanical operation could not remove, they are next exposed to the action of a rapid current of hot air, by placing them over the nozzles *g, g,* of the apparatus represented at figs. 1, and 2; care being taken to remove the corks from the tap-holes, so that a free passage may be left for the aqueous and other vapours generated by the hot air. When a very high temperature is found necessary, to purify the casks from every perceptible taint of must, or other bad odour, a small quantity of steam is introduced along with the hot air; the steam is supplied by the boiler *h,* placed over the hot air pipes, and is conveyed by the pipe *i,* furnished with a sluice-cock *j,* to the pipe or passage *e.*

The apparatus at figs. 3, and 4, is represented as capable of containing only two casks, but any required number of frames for holding casks may be combined in the same machine.

In conclusion, the patentees say, "We declare that though we have spoken of atmospheric air as that which is heated and driven in rapid currents into contact with the casks, vats, and other vessels to be cleansed, purified, and sweetened, we do not limit ourselves to the use of such air alone, but claim a right to the use of any other sort of air, which, being heated and driven in rapid currents, as aforesaid, will produce the like effects. And we declare, that what we claim is, Firstly,—the employment, in the manner aforesaid, of rapid currents of hot air, to effect the cleansing, purifying, and sweetening of casks, vats, and other vessels. Secondly,—the employment, in the manner aforesaid, of rapid currents of hot air in combination with currents of steam. And, Thirdly,—the machine, hereinbefore described, for cleansing the inside of casks and other like vessels, without removing the head, and all mere modifications thereof, by which the same peculiar results are produced."—[*Inrolled in the Inrolment Office, May*, 1844.]

To Arthur Varnham, *of the Strand, in the county of Middlesex, stationer, for improvements in the manufacture of paper, in order to prevent fraud, which he intends to call safety and protective paper.*—[Sealed 4th February, 1845.]

The safety and protective paper consists of a colored or test sheet of paper, covered with a white or delicately colored sheet on one or both sides.

The following is the mode of manufacturing paper, of the description termed hand-made paper, according to this invention:—The rags for the colored or test paper, after being reduced to "half stuff," and bleached, if necessary (being, in this case, carefully deprived of the bleaching liquid), are introduced into the beating engine, which should have steel or brass bars and fittings, according to the color required for the test paper. When the engine is "half beat," the coloring

matter is to be added; the engine is then reduced to pulp, and emptied into a chest, which is called No. 2. The coloring matter is prepared with great care in vessels of glass or earthenware, to prevent the delicacy of the color being impaired; it may consist of any coloring matter usually employed for coloring paper, and also of all others susceptible of change from chemical action. The rags for the outer sheet or sheets, which are to be of a more tender kind, after being reduced to half pulp, and bleached, if necessary, are introduced into the beating engine; and if the paper is to be engine-sized, a resinous size is added to the pulp, together with a small quantity of alum. When reduced to pulp, the engine is emptied into a chest called No. 1; and if a delicate color is to be given to the outside sheet or sheets, the color is then added to the pulp. Two vats Nos. 1, and 2, are employed in the manufacture of this paper, being supplied with pulp from the chests Nos. 1, and 2. The vat-man first makes a white or delicately colored sheet, on a suitable mould, from vat No. 1, and delivers it to the coucher, who couches it on the first or bottom felt; the vat-man then makes a colored sheet, on a mould of the same size and form, from vat No. 2, and delivers it to the coucher, who couches it on the white or delicately colored sheet, and then places a felt upon it; but if the test sheet is to be covered on both sides, another sheet is made from vat No. 1, and couched on to the test sheet, previous to placing the felt thereon. The vat-man and coucher continue to work in this manner until a post of felts is completed; and after the post has been well pressed, the pack-pressing, parting, drying, and sizing (if necessary), are peformed in the usual manner.

The mode of making this paper by machinery is as follows:—The two descriptions of pulp, prepared in the manner described for hand-made paper, are caused to flow from the chests into the servers, thence simultaneously on to the wires attached to them, and proceed onwards to the marking dandy, and from it to the couch rolls, where the test sheet and the white or colored sheet or sheets unite, and form one sheet; this sheet then passes on to the felt, and is pressed, dried, and finished, in the usual way.

The patentee states, that he claims, as his invention, "a

white sheet or surface on one or both sides of the test or colored sheet; or a more delicate colored sheet or surface than the test sheet on one or both sides of the test or colored sheet."

The object of this invention is to prevent paper from being tampered with by chemical agents, or acted on by a sharp instrument or rubber, for the purpose of erasing any writing which may be thereon. If a chemical agent be employed, the test sheet will be so changed as to alter conspicuously the former appearance of the paper, and the white or pale-colored sheet or sheets will be imbued with a stain or color, produced by the action of the chemical agents on the test sheet; and it will afterwards be impossible to make the paper assume its original appearance: for if an attempt be made to whiten or renew the delicate color of the outer sheet, the appearance of the test sheet will be destroyed; or, if an attempt be made to color the test sheet, a darker color will likewise be produced on the outer sheet. In the event of a sharp instrument or rubber being used, then, at the places where a figure or word has been obliterated, the test paper will appear conspicuously; and the paper cannot be restored to its original appearance.—[*Inrolled in the Inrolment Office, August,* 1845.]

To John Swindells, *of Manchester, manufacturing chemist, for several improvements in the preparation of various substances for the purpose of dyeing and producing color; also improvements in the application and use of several chemical compounds for the purpose of dyeing and producing color not hitherto made use of.*—[Sealed 12th June, 1844.]

These improvements in dyeing and producing color consist, in the first place, in preparing (when madder, madder root, and munjeet is used) the madder in the following way:—Take any given quantity of madder and reduce it to a fine powder, then mix it with as much of a solution of caustic ammonia, potash, or soda, as will thoroughly carbonize the yellow or fawn coloring matter therein: different kinds of madder will require varying proportions. The best French madder will require one-eighth part of its weight of caustic

alkali, or of ammonia, as much of the solution as will be equivalent in saturating a given weight of an acid, as one-eighth of potash. The powdered madder, when mixed with any of these solutions, is exposed to a heat not exceeding 175° Fahr.; it is then dissolved in water, and is ready to be used in dyeing, or, forming madder lakes or pinks.

If preferred, the madder may be first treated with sulphuric acid, as in making garancine, and the alkali afterwards applied. By this method the operation of heat upon the alkalies will not be required, but they may be dissolved in a solution of any of the alkalies, or their carbonates, or other salts thereof: for these purposes the patentee prefers the caustic solution of ammonia, as producing the best effects.

Cotton and linen fabrics which are required to be dyed with the prepared madder, or with the common kinds, or even with other vegetable matters, are prepared in the following manner:—After the fabrics are bleached, and thoroughly cleansed from impurities, they are steeped in a solution of gelatine or albumen, of a specific gravity of 1.04, for several hours; they are then removed, and steeped in a strong solution of tannin for twelve hours; after which they must be wrung out and thoroughly dried. This process may be repeated, or not, according to the depth of color required; and the usual process of dyeing may be proceeded with in the ordinary way.

The second part of the invention consists in preparing, for dyeing blues and similar colors, the compounds of cyanogen and ammonia, as follows:—

Instead of horn, and hoof, and other animal matters, commonly employed for this purpose, the patentee grinds to a fine powder common coal, cannel coke, or charcoal, or other carbonaceous matter, and mixes therewith a solution of gelatine or albumen, or both combined; and after thoroughly drying the compound, he uses it in the same way as the horn and hoof is used. Another method of producing the compounds of nitrogen, viz., cyanogen or prussiates and ammonia, consists in combining nitrogen gas or the oxides of nitrogen with carbon, as follows:—When nitrogen is to be used, it may be obtained by passing atmospheric air, or any of its com-

pounds or mixtures through heated carbonaceous matter; but charcoal or coke is preferred, so as to form oxygen, if it be atmospheric air, into carbonic acid. In order to accelerate the process, the mixed nitrogen and carbonic acid is forced through lime, either in a semi-fluid or hydrate state; or it may be passed through an alkaline solution, or through alkaline earth, which will take up the whole of the carbonic acid, and any aqueous vapour that may be present, leaving the nitrogen gas moderately free from other gases. The nitrogen gas is then passed through charcoal, previously saturated with potash or soda, kept to a full red heat in a close retort, until the required quantity of cyanide is produced. If ammonia is required to be obtained, nitrogen gas is passed, together with one-fourth its volume of steam, through charcoal kept to a red heat; the ammonia so produced is condensed by the usual process. Or atmospheric air may be used, and passed with steam through carbonaceous substances kept to a red heat, either in open or close vessels. When the protoxide, deutoxide, or nitrous vapour is employed for producing cyanogen, the same process may be used as that described in operating with nitrogen gas. In forming ammonia, or its compounds, from the oxides of nitrogen or nitrous vapour, they are passed with their own volume of steam through charcoal, at a red heat, either in close or open vessels; but if cyanogen is to be produced, the apparatus containing the charcoal, must be air-tight, in order to exclude oxygen, carbonic acid, or aqueous vapour.

The third part of the invention, viz., improvements in the application and use of several chemical compounds for the purpose of dyeing or producing color, consists in operating upon a class of salts not hitherto used in producing color.

The cyanides, ferro-cyanides, or other salts of cyanogen, are employed for the above purpose, by separating the acid, which is required to produce the color, from its combination with barium, strontium, or calcium: the patentee prefers to operate on a salt of barium; and he precipitates the barium by its equivalent quantity of sulphuric acid, diluted with as much water as may be necessary to produce the required strength of acid to be used in dyeing. The chromates and

bichromates of barytes, strontia, or lime, are also treated with sulphuric acid and water, to separate their bases from the chromic acid. The manganates of barytes, strontia, or lime, are likewise treated in the same manner. The acid solutions thus obtained are employed for raising, dyeing, and oxidating various colored fabrics.

The patentee claims, Firstly, the use of ammonia or other alkalies for preparing a madder dyeing liquor. Secondly, the process of preparing cotton and linen, by subjecting them to the action of gelatine, or albumen, and tannin. Thirdly, the mode of preparing materials for the manufacture of cyanogen or prussiates, by using gelatine or albumen mixed or ground together with carbonaceous matter of any description. Fourthly, the production of cyanogen and its compounds by operating on nitrogen gas, after having removed any other gas or aqueous vapour therefrom, before introducing it to the heated carbonaceous matter. Fifthly, the production of cyanogen and its compounds, by operating on the oxides of nitrogen or nitrous vapour, however procured, by bringing them in contact with heated carbonaceous matter, either after having separated the oxygen or without separating it. Sixthly, the production of ammonia, or its salts, by operating on the nitrogen of the atmosphere, or any other oxides of nitrogen, in conjunction with aqueous vapour, and passing the same through heated carbonaceous matter. Seventhly, the application or use of the cyanides, ferro-cyanides, or chloro-cyanides, or any other combination of cyanogen and barium, strontium, or calcium, in dyeing, printing, or producing color. Eighthly, the use and application of the chromates or bichromates of barytes, strontia, or lime, for the purpose of dyeing, printing, and producing color. Ninthly, the use and introduction of the manganates of barytes, strontia, or lime, for the same purposes.—[*Inrolled in the Inrolment Office, December,* 1844.]

To George Brown, *of Glasgow, in Scotland, merchant, for certain improvements in the manufacture of soda,—being a communication.*—[Sealed 20th February, 1845.]

The object of this invention is to transform the sulphuret of

sodium, produced in the manufacture of soda, into sulphate, sulphite, or hyposulphite of soda, and so make soda free from those impurities which render it less fit than it otherwise would be for soap-making, bleaching, and other uses. The patentee proposes to effect this by fluxing the soda, containing sulphuret of sodium, with a sufficient quantity of nitrate, chlorate, or chlorite of soda, or other body possessing an oxidizing power; but, in most cases, he prefers to use the nitrate of soda.

One mode of carrying this invention into effect is as follows:—The liquor drawn from crude soda is boiled down in a pan or furnace, until about four-fifths of the salt are precipitated; the whole is then removed from the furnace, and the wet pasty salt allowed to remain for some time in a vessel to drain; by this means the greatest proportion of the liquor that remained in the mass (commonly known as red liquor) will be separated from it. The red liquor (which consists chiefly of caustic soda and sulphuret of sodium, with a certain proportion of neutral salts, such as sulphate of soda and common salt) is put into a metal pan, and evaporated to about the consistency of tar; then the proper quantity of nitrate of soda is added, and heat applied to expel the remaining water, and flux the mass. The application of heat causes copious fumes of ammonia to be exhaled, and the mass froths and bubbles up, which serves as a guide to the operator in adding the nitrate of soda; as when no ebullition is produced by the addition of a fresh portion of nitrate of soda, it is a proof that the proper quantity has been added. When the mass is brought to a quiet flux, it is run into moulds; and when removed therefrom, is ready for use.

Another mode of proceeding is, to boil down the whole quantity of crude soda liquor; and during the boiling, when the liquor is brought to about the consistency of tar, to add the nitrate of soda, or other oxidizing body; and, the evaporation being completed, flux the soda containing the sulphuret of sodium.

The patentee claims, as his invention, the improvement in soda-making by fluxing the soda, containing sulphuret of sodium, with bodies possessing an oxidizing power.—[*Inrolled in the Inrolment Office, August,* 1845.]

To William Trueman Yule, *of Wilson Street, Finsbury-square, in the county of Middlesex, preserved provision manufacturer, for improvements in preserving animal and vegetable matters.*—[Sealed 28th January, 1845.]

The first part of this invention consists in drying animal and vegetable matters, when preserving the same, by passing over them a current of air, which has been previously dried by passing it through calcined chloride of calcium or other chemical absorbent of moisture.

The animal and vegetable matters to be preserved may be either in a cooked or uncooked state; they are hung up in a chamber of an oblong form, or placed on shelves therein, and are subjected to the action of a current of air, which has been dried by passing through calcined chloride of calcium. The chloride of calcium is broken into pieces about the size of a walnut, and placed in a vessel with a grating at the bottom, through which it flows, as it becomes dissolved, into a receptacle below; and the dissolved portion being evaporated to dryness, and calcined, is again placed at the top of the vessel. The vessel containing the chloride of calcium may be placed between the chamber and the air-pump used for producing the current of air, so that the air will be forced through the chloride of calcium, and then through the chamber; or the air-pump may be situated at the other extremity of the chamber, so as to draw the air through the chloride of calcium, and then through the chamber.

The second part of the invention consists in keeping animal and vegetable matters dry, when preserving them in closed vessels, by placing chloride of calcium or other chemical absorbent in such vessels, but not in contact with the matters to be preserved.

It is well known that chloride of calcium possesses a great affinity for water; and that the decomposition of animal or vegetable matters takes place much more slowly in a dry than in a moist atmosphere. The patentee takes advantage of these properties to preserve for a long time such animal or vegetable matters as have already been more or less perfectly

dried, or more or less perfectly preserved with an antiseptic, such as hams, tongues, cheese, dried fruits, vegetables, &c.; and the plan he adopts is to put them in air-tight vessels or cases along with the chloride of calcium. The cases are preferred to be made of tin; and it is considered advantageous to create a partial vacuum therein, by means of an air-pump, when the animal or vegetable matters are very moist. The quantity of chloride of calcium used, is generally one-tenth of the weight of the substances to be preserved; but this proportion is varied, according to the state of dryness of the substances when put into the case. The chloride of calcium is broken into pieces of about the size of a walnut; and, in packing the cases, it is wrapped up, in quantities of about one pound, in blotting paper or calico, and put in with the articles to be preserved; and the interstices between these articles are filled with husks of corn.

If the animal or vegetable matters have not been dried, the air is exhausted from the cases, and a larger proportion of chloride of calcium is used, say about three or four times the weight of the substances.

The patentee claims, Firstly,—preserving animal and vegetable matters by drying the same by the aid of streams of air, dried by chemieal means, as herein described. Secondly,—preserving animal and vegetable matters inclosed vessels, by drying, and keeping them dry, by means of chloride of calcium or other similar chemical absorbent.—[*Inrolled in the Inrolment Office, July,* 1845.]

REPORTS OF AMERICAN PATENTS.

From the "Journal of the Franklin Institute,"

EDITED BY DR. THOMAS P. JONES.

To A. D. CHILDS, *Rochester, Monroe county, New York, for an improvement in horse power.*

THIS horse power, like many before it, is on the general principle of the sun and planet movement; motion is communicated to a central vertical shaft provided with a mitre wheel near its lower;

and a pinion near its upper end, the former driving the line shaft, and the latter receiving motion from three planet wheels arranged at equal distances around it, and each provided with a pinion on its arbor, the teeth of which take into cogs on the inner periphery of a permanent ring. The planet wheels turn on, and are carried around the central shaft by studs projecting downwards from a cap plate, (so formed as to make an entire covering to the whole machine,) which is guided and kept steady in rotating by means of rollers that embrace a flanch projecting from the outer periphery of the permanent ring, and others which bear against the inner periphery of the ring—the central shaft having its upper bearing in the centre of this cap plate.

Claim:—"What I claim as my invention, is the method of sustaining the upper end of the centre shaft, and guiding the pitch of the planet wheel pinions by means of the cap, as described, which is guided by rollers on the studs of the cap, under the planet wheels, bearing the rolling on the inner periphery of the planet ring, by means of which a stationary centre is dispensed with and the wheels are protected."

To JEHU HATFIELD, *Glenn's Falls, Warren county, New York, for an improvement in the machine for computing interest, measuring lumber, and for other similar purposes.*

THIS machine consists of a vertical revolving cylinder, having on its outer surface vertical parallel columns of figures, or signs, representing the interest on the several sums shewn in a stationary column on a surrounding case. There is also a circular scale, or dial, placed in front of the case in a vertical position, to indicate the days of the month, with an index hand, or pointer, which is operated by the cylinder—the two being connected together by mitre wheels.

Claim:—"In the old revolving interest table," says the patentee, "there was a cylinder containing the interest, having the days and months stated at the head of each column, (instead of a dial and pointer,) enclosed in a round paste-board case, or box, having an opening in front with the principal pasted on one side; the cylinder being made to revolve by turning the shaft at the lower end with the fingers; and, therefore, I wish it to be understood, that I make no claim to any part of this arrangement, but what I do claim as my invention, and which I desire to secure by letters patent, is the before-described combination of the revolving cylinder, containing the vertical columns of numbers indicating the interest, with the permanent vertical scale shewing the principal, and the dial representing the days and months for which the interest is to be ascertained, and the pointer operated in the manner, and for the purpose set forth, or in any other

mode substantially the same, by which analogous results are produced."

To Benjamin Webb, *Warren, Herkimer county, New York, for an improvement in the mode of setting logs on saw-mill carriages.*

The slide of the tail block projects beyond the side of the carriage, and is there provided with a roller, which, as the carriage is run back, comes against an inclined guide, by which it is pushed with the log on it; and, for the purpose of keeping up this action, the inclined guide is attached to a slide which is, at each forward movement of the carriage, drawn towards the carriage a distance equal to the thickness of the plank to be sawed, and there held by a pall on the slide catching in the teeth of a rack on the floor below the slide. The moving of the slide is effected by an arm that extends from and beyond the end of the tail block slide, provided with a latch, which, on the forward movement of the carriage, acts on the back face of a bevel attached to the plate of the inclined guide, and back of it; this bevel is made adjustable for the purpose of regulating the thickness of the log to be sawed, and the catch is jointed, so that, on the return of the carriage, it may pass over the bevel.

Claim:—"What I claim as my invention, is setting the end of the log by causing the end of the slide upon which the log is dogged, as the carriage is gigged back, to come in contact with an inclined guide, which is again moved laterally towards the carriage the required distance for another and similar set, as the carriage advances towards the saw, by means of a latch, or other similar appendage, in contact with an inclined gauge, or adjustable bevel, attached to the slide carrying the aforesaid guide, in which position the said inclined guide and guage are held by a pall attached to the said slide dropping into a rack fixed on the frame of the mill, or other suitable place, and this method of setting the log I claim, whether it be effected by the combination of parts above set forth, or any other, substantially the same for producing like results."

To Thomas Shailer, *Haddam, Middlesex county, Connecticut, for a mode of catching moles.*

A number of pointed wires are attached to a sliding board, with their points downwards, and to the upper part of the slide there is attached a cord, which passes over a roller, to hold up the slide with its teeth, or wires, and having its other end provided with a fly lever, connected by means of a notch with one end of a trigger lever, the other end resting on the surface of the ground,

so that the moving of the earth by the mole shall liberate the fly lever, and permit the slide with the pointed wires to fall on to the mole.

Claim:—"What I claim as my invention, is the manner in which I have combined the lever, one end of which is to rest on the ground, with the sliding board and the pointed wires with each other, and with the other parts of the trap, so that the raising of the ground by the mole shall cause the wires to descend; the respective parts being arranged substantially as described."

To RICHARD I. GATLING, *Murfreesborough, Hartford county, North Carolina, for an improvement in the machine for planting rice and other grain.*

IN this machine there is a horizontal roller with channels, or grooves, in the direction of its circumference, and at distances apart equal to the space between the furrows; above this is placed a hopper, with a leather bottom, resting on the roller, and having a hole for each channel, through which the rice, or other grain, passes into the channels, by which they are carried down into inclined spouts, that discharge them in the furrows, prepared by teeth, forward of the inclined spouts.

Claim:—"What I claim as my invention, and desire to secure by letters patent, is the combination and arrangement of the perforated hopper, revolving channeled cylinder, and inclined conductors, as described."

To HENRY B. JAMES, *Mount Holly, Burlington county, New Jersey, for an improvement in the smut machine for cleaning wheat, &c.*

THIS machine is a modification of that class of smut machines which have been extensively used, and which, therefore, have been the prolific source of improvement, or modifications, and hence of patents. It consists of a set of beaters, or fans, on a vertical shaft within a case, through which the grain passes to receive the action of the beaters, or fans, and of an upward current of air produced by the fans. In this instance the case is conical, and fluted on the inside, and the beaters, or fans, are constructed in a manner fully expressed in the subjoined claim. The top of the case is provided with a spiral flue, or trunk, through which the grain passes into the machine, and where it is acted upon by the current of air before it reaches the beaters or fans.

Claim:—"What I claim as my invention, is the arrangement of the circular trunk, as described, to conduct the air, and float out foreign matter from the machine, and the fans constructed of

two or more sets of leaves, or plates, arranged one above another on a common shaft, said plates being placed diagonally upon said shaft, and arranged so that the leaves of one tier shall break joints with those above them, to act upon the grain, in combination with a stationary inverted cone, roughened on the inner surface by slight flues, or otherwise, and to produce a current of air through the machine as described."

To CHARLES ROSS, *Piqua, Miamia county, Ohio, for a revolving rule, for measuring surfaces, and particularly applicable to lumber.*

A WHEEL, of one foot in circumference, is so arranged in a case, as to have a portion of its periphery project beyond the case, and a portion of its face visible through a hole, the edge of which is graduated to correspond with concentric circles on the face of the wheel, graduated in the manner of the common lumber rule. The shaft of this wheel is geared with the shaft of a cylinder, so that the latter will make one revolution to thirty-six of the former, there being thirty-six divisions to indicate the number of revolutions made by the wheel; and the shaft of this cylinder is geared with another cylinder, which makes twelve revolutions to one, to mark the number of revolutions made by the first cylinder. The scales on the wheel and cylinders are so arranged as to give the superficial as well as the running measure.

Claim:—"What I claim as my invention, is the combination of the common board rule with the self-calculating cylinders, and their combined application to the measurement of plane surfaces in general, but more particularly to the measurement of the superficial contents of boards, planks, and lumber."

To HENRY B. FERNALD, *of Boston, Massachusetts, for an improvement in lamps.*

IN this lamp there is an annular distributing reservoir some distance above, and communicating with the burner by a tube, (designated in the following claim by the letter *a*,) and by another tube (*b*,) with a hand pump, in a main reservoir in the pedestal of the lamp, by which the oil is forced into the distributing reservoir. There is another tube to discharge the surplus oil from the distributing reservoir, and the tube (*a*) that supplies the burner, into the main reservoir—the tube (*b*,) for these purposes, extending to the upper level of the distributing reservoir, and communicating by a hole with the tube (*a*) at, or near, the level of the burner.

Claim:—"I claim the apparatus added to, and combined with, the burner, and the main reservoir, for the purpose of maintain-

ing the oil in the wick case at a constant level, with respect to the wick; the same consisting of the distributing fountain, and tubes (*a* and *b*) proceeding therefrom, and opening into, or communicating with, each other, (at the level, or about the level, of the top of the burner,) and with the column, or reservoir, as before set forth; the whole being arranged and operating in connection with the burner and fountain beneath the same, substantially as specified."

To ABRAHAM STRAUB, *of Milton, Northumberland county, Pennsylvania, for an improvement in the smut machine for cleaning grain.*

THE nature of this invention consists in forming an involuted conductor for the grain, from the centre to the periphery, under the fan upon the runner, at which point it is subjected to the action of the beaters, and wind from the fan at the same time, and is cleaned of all the loose dirt and smut as fast as it is broken.

Claim:—"What I claim as my invention, is constructing the runner in the manner set forth, having involuted conductors on it, intersected at the periphery by beaters, and surmounted by a fan; the whole being arranged substantially in the manner and for the purpose specified."

To JOHN SEBO, *Wilmington, Delaware, for an improvement in awnings for the front of shops, &c.*

THIS awning is attached, by its upper end, to a roller having its bearings in staples attached to the house, and its other end to a pole, and from this pole a set of sustaining cords extend over the awning, around the roller next the house under the awning, and thence around a roller on posts at the edge of the walk; and below this, and revolving with the same velocity, there is another roller, on which wind another set of cords. This first set of cords not only sustain the awning, but, by winding on the roller at the top of the posts, answer the purpose of rolling it up on the roller next the house, whilst the second set of cords unroll it, the two sets rolling and unrolling on the two rollers, which have this purpose equal velocities.

Claim:—"What I claim as my invention, is sustaining the roller next the house, by means of a cord passing over pulleys, and winding up with the cloth, conducted in the manner and for the purpose set forth; I also claim, in combination with the awning, the rollers, one for the awning, and the other for the sustaining cords, as described."

To Elisha Reid, *Columbus, Georgia, for an improvement in oil boxes for preventing journals from heating.*

Claim:—"What I claim as my invention, is the prevention of heating journals and boxes, by surrounding the boxes with a reservoir of water, in such manner as to prevent the access of water to the oil box and journals, as described, thereby preventing heat, and, consequently, the drying away of oil, and wear of the rubbing surfaces, and the necessity of frequent oiling, using for the reservoir any suitable material, and any composition of metal for the bearings."

To Simeon Broadmeadow, *New York City, for an improvement in the process of converting iron into steel.*

The patentee says,—"My improvement consists in the using of a permanent roof of fire stone, or fire brick, in place of the temporary covering heretofore employed. I also use a sliding shutter, which is placed in front of the furnace, so that it may be brought down as required. My improvement in the manufacturing of the steel, after the process of cementation has been completed, consists in the taking of the bars first from the upper part of the convertory, whilst they are at the highest temperature to which they are to be brought, and subjecting them immediately to the action of tilting, or of rolling, without the necessity of re-heating. To do this a part of the upper layer of bricks, which enclose the converting oven, is first removed, so as to enable one to draw out the upper bars, and as the bars are successively operated upon, the bricks are further removed, until the whole contents of the convertory have been tilted or rolled. As this process goes on, the sliding shutter is brought down, so as to enclose the part from which the bricks have been removed. By this procedure several advantages are attained in the process of manufacturing steel. Under that hitherto followed, the whole charge has been allowed to cool down before removing the steel from the convertory, and this necessarily resulted in great loss of time, the bars, after being removed, had to be re-heated, in order to their being tilted or rolled: by this re-heating, time was consumed, and the steel actually injured, it being a well-established fact, that every time steel is highly heated it is deteriorated."

Claim:—"What I claim as new, is the improvement herein described, of taking the steel from the oven in its heated state, and subjecting it to the action of rollers, or the tilt hammer, without the necessity of re-heating the bars; by which improvement said manufacture is greatly facilitated, and the quality of the steel much improved."

To DENNIS RICE, *Rowe, Franklin county, Massachusetts, for a harrow or sward cutter.*

THE teeth of this harrow are arranged in the usual manner, in a triangular frame, but, instead of being straight and pointed, they are bent back in a segment of a circle, with the front edge sharp, to cut the sward.

Claim:—"What I claim is the mode described of constructing the sward cutter harrow; that is to say, by using and combining with the harrow frame a suitable number of movable harrow teeth of the above description, for the purpose specified."

Scientific Adjudication.

COURT OF CHANCERY.

Before the Lord Chancellor,—August 14th, 1845.

RE GRIFFITHS AND SAMUDA'S PATENT.

THIS case, which involves the conflicting claims of Mr. GRIFFITHS and Mr. SAMUDA to the right of the Great Seal upon an English patent, which they had each applied for, will be read with interest, as it further confirms the decisions which excited so much surprise in the case of Brown *v.* Annandale,* relative to prior knowledge in England, being a publication in Scotland.

Mr. SWANSTON and Mr. PETERSDORF (of the common law bar) appeared in support of Mr. Griffiths' petition.

It would appear, that on the 10th of October, 1844, Mr. Samuda had obtained a patent in Scotland for an invention which introduced an improved method of constructing and working the apparatus of atmospheric railways. On the 6th of December, 1844, Mr. Griffiths applied for a patent in this country for an original invention of his own, as he alleged, having also for its object an improved mode of constructing and working atmospheric railways. On the 13th of January, 1845, Mr. Samuda applied for a patent in England, having a similar object in view. It appears that on the 31st of January, 1845, Mr. Samuda having been apprised by Mr. Brunel that an application for a patent had been made for an invention identical with his own, Mr. Samuda proceeded to perfect the patent he had obtained in Scotland by enrolling his specification, which he did on the 4th of February, 1845. He then entered a caveat with the Attorney-General to prevent Mr. Griffiths from obtaining a patent for his invention in this country, Mr. Samuda claiming a priority as to the originality of his invention, and also his having obtained a prior patent for

* See Vol. XXI., p. 274, London Journal.

it in Scotland, which, in point of law, it was considered operated so as to take away from Mr. Griffiths any right he might originally have had to obtain a patent for his invention in England. Under this state of things the rival claims of the parties were referred to the Attorney-General for adjudication. The Attorney-General had reported that both inventions were the same; that Mr. Samuda was the first inventor for Scotland, but that he was of opinion that neither Mr. Griffiths nor Mr. Samuda was entitled to a patent in respect of the invention in question in this country. Mr. Griffiths, by his present petition, and his affidavits in support of it, insisted that Mr. Samuda, at the time he took out his patent for Scotland on the 10th of October, had no knowledge of that which constituted the novelty of his (Mr. Griffiths') invention, and for which he had applied for a patent on the 6th of December, 1844. He insisted, likewise, that Mr. Samuda had copied from his (Griffiths') invention the novel principle of his own, which was shewn by the circumstance that Mr. Samuda having been apprised of his (Mr. Griffiths') invention on the 31st of January, 1845, immediately did that which he had neglected to do before—namely, enrolled the specification of his patent in Scotland; embodying in that specification, and thereby adding to his patent in Scotland, the improved and original invention of the petitioner. Mr. Samuda had failed to define the exact time when he became possessed of what he now claimed as his original invention, although Mr. Griffiths stated the precise date at which he claimed to be in possession of his. Under these circumstances, counsel submitted that Mr. Griffiths should have the patent he applied for sealed in his favour, as the true and original inventor of the discovery in question.

Mr. J. Parker, on behalf of Mr. Samuda, was heard at some length in opposition to the petition. He denied, on behalf of his client, the correctness of the representations insisted on by Mr. Griffiths. Mr. Samuda claimed a priority in respect to the originality of his invention. He stated in his affidavit, that in December, 1844, he was making experiments in regard of it, and that he had a working model of it prepared on the 11th of January, 1845, which was previous to his obtaining the information referred to from Mr. Brunel, and that he was prevented from enrolling his specification in this country in regard to it on account of the opposition made to his claim for a patent. He denied that he directly or indirectly had obtained his invention from any knowledge he had gathered of Mr. Griffiths' invention, or from any other source. Under these circustances it was submitted by the learned counsel that as both the parties were in possession of an invention in this country, which had already been published in Scotland, neither of them, according to the practice of the Court in these matters, and in conformity with the decision in the case of "Brown *v.* Annandale," in the House of Lords, could have a patent granted to them.

Mr. SWANSTON having replied on behalf of Mr. Griffiths,

The LORD CHANCELLOR said, that there was not enough in the evidence to lead him to the conclusion that the invention of Mr. Samuda was taken by him from Mr. Griffiths, and his Lordship entertained a strong opinion on the point (having regard to the case of Brown *v.* Annandale," decided by the House of Lords), that the publication of the invention in Scotland was a publication of it in this county, and that, therefore, a party could not obtain a patent for it in England. His Lordship thought the facts did not make out such a case as would warrant him in saying that Mr. Samuda unfairly possessed himself of the invention. All the points insisted on by the petitioner were answered, in his Lordship's opinion, satisfactorily by Mr. Samuda; and for these reasons the prayer of Mr. Griffiths' petition must be refused.

WESTERN CIRCUIT.

Before Mr. Justice Erle and a Special Jury.—Bristol, Aug. 23, 1845.

PROSSER *v.* CHAMBERLAIN AND ANOTHER.

THE declaration in this case stated, that the plaintiff was the first inventor of buttons in porcelain, and for which he had obtained letters patent, and it then alleged that the defendants had infringed that patent. To this declaration the defendants pleaded that they were not guilty; that no letters patent had been granted, and the plaintiff was not the first inventor; that the invention had been known before the patent had been granted; and that the invention had not been properly described.

The action was brought for the purpose of asserting the right of the plaintiff to this patent for making buttons of porcelain. The evidence of the plaintiff lasted nearly the whole of Friday. The defendants' case was opened, and this morning the case was about to be proceeded with, when a consultation having taken place between the counsel, it was stated that it had been agreed that a verdict should be taken for the plaintiff, with forty shillings damages, subject to arrangement.

Scientific Notices.

ON STAINING GLASS.

BY PROFESSOR SCHUBARTH.

MODE OF OBTAINING A RED COLOR BY MEANS OF OXIDE OF COPPER.

THE ancients were acquainted with the means of staining glass by the employment of oxide of copper; it is mentioned by Neri and

Kunckel, in their works. The art was however so completely lost at the close of the last century, that it was generally believed that glass was always stained red by means of Cassius purple. It was not until 1828 that M. Engelhardt, of Zinsweiler, succeeded in staining glass red by means of a mixture of equal parts of oxide of copper and protoxide of tin: this process was tried with success in the glass manufactory at Hoffurmgsthal, Silesia.

The protoxide of tin is now done away with, and the compound employed is nearly the same as that mentioned by Neri, but more simple. It is composed of a mixture of copper scales (which are almost entirely composed of oxide), and oxide of tin (*zinnasche*) obtained by the oxidation of that metal in a state of fusion in contact with the air, to which a small quantity of iron filings is sometimes added, when a scarlet tint is required to be produced. Should the color by accident disappear, it may be brought out by again bringing the copper into the state of oxide; this is done by introducing into the vessel a small quantity of tin or iron scale. It will of course be understood that the glass to be operated upon must not contain saltpetre, nor any other oxidizing substance.

Glass stained by means of oxide of copper is of a very deep color, and can only be worked in thin sheets, and by covering it with a thick colorless glass (plate glass).

OBTAINING A RED COLOR BY MEANS OF GOLD.

The employment of gold for staining glass red does not appear to have been known to the ancients, and the period when it was first used, and by whom, cannot be ascertained. In the seventeenth century Kunckel employed Cassius purple for staining glass a ruby color; this was discovered by A. Cassius a short time previous; but the recipe employed by Kunckel was not generally known until it was published in 1836, by M. Metzger, proprietor of the glass-works at Zechlin, on the occasion of M. Fuss' researches.

It must not be imagined from this, as some persons have lately stated, that it is necessary to use gold in the state of Cassius purple.

Neri, at the end of the sixteenth and commencement of the seventeenth century, stated, that in order to stain glass a ruby color, it was only necessary to employ calcined chloride of gold. At a later period, Libar wrote to the same effect, and Merret certified that he had proved the efficacy of the process. In 1834 Golfier Besseyre stated, in the Journal of Pharmacy, that Douault Wieland colored his paste with perchloride of gold only. Lastly, in 1836, Fuss writes, that in Bohemia all the ruby-colored glass was prepared with chloride of gold only, and that glass might be stained red as well with metallic gold, as with oxide of gold or Cassius purple.

It is therefore a fact known for some time, that glass may be stained red, without either Cassius purple or oxide of tin, with metallic gold or preparations of gold. In the glass-works of Bohemia and Silesia perchloride of gold only is used, without the addition of oxide of tin, in order to produce their fine rose or carmine-colored glass.

If powdered gold be triturated with twenty times its weight of enamel fritt, a light red or pink mass will be produced, without any metallic lustre. By heating for a length of time at a temperature of 110° of Wedgwood's pyrometer, a compound of metallic gold and quartz ground very fine upon porphyry, and intimately mixed, the latter will be stained a pink color. Pieces of gilt porcelain which have been a long time in use, are stained red at those parts where nearly the whole of the gold had become worn off; gold volatilizes under the action of a powerful electric battery, or the heat of the oxyhydrogen blow-pipe in the form of a very light purple powder. Fulminating gold, in detonating upon a silver plate also leaves thereon a purplish powder: if this latter is then mixed with silica and heated, it will be stained a reddish color; the gold exists in very minute particles, but not in the state of oxide.

If, by the aid of heat, a solution of gold in *aqua regia* be decomposed by means of oxalic acid, the liquor appears green and even blue, and a brownish powder is precipitated, the particles of which touching the sides of the receiver are yellow, and have metallic lustre. It is certain that this green, blue, brown, and sometimes yellow powder is metallic gold.

If perchloride of gold be treated with albumen and the precipitate exposed to the action of the solar rays, it will assume a red tint. A solution of gold colors the skin red. Silk dyed with perchloride of gold becomes blue, green, and purple, under the action of the solar rays. All these effects are certainly due to metallic gold.

It is evident that at the temperature of glass-houses, which is more than sufficiently high to effect the fusion of the glass, the gold contained in the Cassius purple will be brought back into the metallic state, whatever may be supposed to be the nature of this compound, upon which chemists have not yet agreed. If Cassius purple, chloride of gold, or gold leaf, be heated with borax or glass containing lead, to a temperature of 32° of Wedgwood's pyrometer, the gold will be precipitated in small globules at the bottom of the crucible, and if the heat be increased, the borax or glass will successively assume a yellow, brownish yellow, green, and bluish green, orange, deep orange, and lastly, a purple red color, according as the temperature is raised and kept up.

We have verified the following fact stated by Golfier Besseyre:—On triturating gold powder chemically pure with soot, mixing it intimately with a composition of glass containing lead (commonly called flint glass), and melting the whole in a glass-furnace, a

glass is produced perfectly colorless at top, and presenting successively the following colors from top to bottom, viz:—greenish-yellow, topaz-yellow, yellowish-brown, dark reddish-brown, and is even in some parts towards the bottom rather dull. M. Pohl has observed, that flint glass mixed with a small quantity of perchloride of gold, generally appears green after melting and cooling, some parts only having a red tint. On the contrary, on melting together glass containing a very small proportion of red lead and a small quantity of borax, with a solution in *aqua regia* of 6 ducats to 48lbs. of fritt, after remaining in a state of fusion for six or seven hours, a perfectly colorless glass is obtained, which when worked into very thin plates, takes, upon cooling, a fine red color. Knox states that gold melted with glass stains it green, which is deeper in proportion to the quantity of silica it contains, and that if the temperature be raised, it changes to pale red.

It is well known that colorless glass containing no lead, but containing gold, remains colorless when cooled very slowly, but takes a red color when cooled suddenly, or when re-heated to a dull red heat. Splittgerber has lately proved that this takes place in a similar manner in atmospheric air, oxygen and hydrogen, surrounded by sand, by coal-dust, and protoxide of zinc, or in nitre and chlorate of potash melted: it cannot then be attributed to oxidation or reduction, but simply to a molecular change of the particles of gold, produced by the action of heat.

Golfier Besseyre observes, that on melting glass which has been stained red by gold, and keeping it in a state of fusion for some time, and cooling it very slowly, it becomes colorless, and on being again heated, again takes a red tint, bordering upon violet. By repeating this operation, the glass successively assumes violet and blue colors, and finally becomes completely colorless. Splittgerber confirms this fact by stating, that he had observed the density of colored glass to be somewhat less than that of colorless glass.

When glass stained by means of gold is heated too often, or exposed to too high a temperature, it takes a light brown color, loses its transparency, and will not again take a red color; on being looked through, it will be seen that some parts are colored a fine blue and bluish green; and grains of gold of various sizes may be seen with the naked eye (this state bears the greatest analogy to the phenomenon presented by a solution of gold slightly heated with oxalic acid). Pieces of colorless glass containing gold, cooled very suddenly, cannot by any known means be made to take a red color, and remain perfectly colorless.

In conclusion we may state:—

1st. That in order to stain glass a red color by means of gold, it is not necessary to use Cassius purple, or to add to the chloride of gold either oxide of tin, or oxide of antimony.

2ndly. That by the addition of chloride of gold, or even metallic

gold in minute particles, either to a very fusible glass of lead, or soda glass, containing a very small portion of minium (red oxide of lead), glass may be produced which will take a red color whilst being worked.

3rdly. That if Cassius purple be employed, it will be decomposed during the fusion of the glass, and metallic gold will be precipitated from it.

4thly. That on grinding metallic gold to fine powder, upon porphery with hard substances, a red colored mixture will be produced.

5thly. That the coloring of the glass appears in all probability to arise from gold in a very comminuted state.

Several other metallic bodies present analogous phenomena.

Platinum and iridium in powder, mixed with enamel or fritt, produce a fine non-metallic black. Metallic silver colors glass a transparent yellow, seen by refraction, and an opaque grayish and bluish green, seen by reflection. If this glass be heated too often it becomes semi-opaque, and small grains of silver appear; this is precisely similar to the effect produced by gold.

In conclusion, it will be sufficient to cite the remarkable changes of color produced by a change in the molecular state of iodide of mercury, carbon, sulphur, selenium, phosphorus, mercury, oxide of iron, &c., to prove that there is nothing to prevent gold presenting the same phenomena.

OBTAINING A BLUE COLOR BY OXIDE OF COPPER.

It is known that oxide of copper furnishes green or blue solutions; and will also stain glass a fine emerald green and light blue, turquoise blue, and sky blue.

For some years past a white milky glass has been manufactured in Bohemia and Silesia, known under the name of alabaster glass. The composition of this glass does not differ from that of ordinary crystal. (Bohemian crystal is a glass made without lead, with potash for its base.) After the glass has been melted, it is poured off and stirred up. A second charge is then melted, to which is added, when the fusion is complete, the glass previously stirred and cooled, which cools the mass; and as soon as it is melted, it is to be worked at the lowest possible temperature. The glass will be of a milky white, while if the temperature were much raised, it would become colorless and transparent.

If oxide or sulphate of copper be added to a colorless glass, and the temperature is sufficiently high, a transparent glass of a bluish geeen tint will be obtained. If the operation has been carried on as above stated to obtain a milky glass, it will be of a turquoise-blue color. Lastly, if this turquoise-blue colored glass be re-melted, at a high temperature, a transparent aqua-marine blue will be produced.—[*Bulletin de la Société d'Encouragement.*]

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 59, Vol. XXVII.)

June 11th, 1844.

The PRESIDENT in the Chair.

"On the purification of Coal Gas, and the application of the products, thereby obtained, to Agricultural and other purposes." By Archibald Angus Croll, Assoc. Inst. C. E.

THE production of coal gas is now become of such importance, from the amount of capital employed in it, and the high degree of public utility resulting from the introduction of gas light, that the author conceives it to be his duty to lay before the Institution, an account of his improvements in the process of purifying and preparing gas for combustion.

In London alone, the annual rental paid to the different Gas Companies, for the supply of coal gas, amounts to about £600,000, and 250,000 tons of coals are annually consumed in its manufacture. As nearly every town of two or three hundred inhabitants, is now lighted with gas, vast as is the consumption of London, it forms but a small portion of the quantity of coal gas produced in the United Kingdom. The use of gas seems, however, to be capable of much greater extension than it has yet attained, for though almost universally adopted in the lighting of streets, workshops, warehouses, and places of business, it has been only partially introduced into domestic use. The causes of this limitation in the use of gas, are sufficiently obvious; they consist mainly in the unpleasant odours and unhealthy effluvia, supposed to be exhaled in its combustion; nor have the objections made, on that account, been without foundation; for it is well known to chemists, that notwithstanding all that modern science and invention have hitherto done, to purify gas, a considerable portion of ammonia, and its compounds, the origin of the offensive and injurious vapour complained of, still exists in combination with the gas, and compounds of a deleterious character are given off during combustion.

The author's attention has long been directed towards the manufacture and purifying of gas, and in the progress of numerous experiments, which were continued through several years, he has been fortunate in the discovery of a very simple process, of entirely freeing coal gas from ammonia, and its various combinations.

The gas used for illumination, is carburetted hydrogen, and the object of all gas manufacturers, is to obtain that gas, in the greatest possible state of purity, and at the least comparative expense. The method of making coal gas is this:—coal being placed in retorts, and subject to a high degree of heat, the carburetted hydrogen gas is generated, from whence it passes, by

well-known contrivances, into the condensing apparatus; but the carburetted hydrogen thus generated, contains several gaseous impurities, the most prominent of which are—1°, sulphuretted hydrogen; 2°, hydro-sulphuret of ammonia; 3°, cyanuret of ammonia; 4°, carbonic acid, &c.; all these impurities have, to a great extent, been got rid of in all well-conducted gas-works. The sulphuretted hydrogen and the carbonic acid, are most effectively removed by means of dry lime; but to its use (until the application of this process), insuperable objections existed, and it has therefore been usually abstracted from carburetted hydrogen, by wet lime purifiers. A large portion of the hydro-sulphuret of ammonia, the cyanuret of ammonia, and the carbonic acid, have been thus expelled, with much trouble and inconvenience. Still a very great quantity of ammonia remains, unaffected by all the processes used for purification, and passes, as before observed, into consumption with the gas itself.

The carburetted hydrogen, thus generated, passes, with all the impurities mentioned, into the condensers, where the hydro-sulphuret of ammonia is to some extent removed, by a reduction of the temperature of the gas, and in this way the ordinary ammoniacal liquor of the gas-works is obtained. That liquor is generally sold to manufacturing chemists, and from it, after saturation with either sulphuric or muriatic acid, the ordinary ammoniacal salts are produced. From each gallon of this liquor about 14 ounces of sulphate of ammonia are produced.

The author's new process of purification is generally employed immediately after the gas passes out of the condensers; or it may be applied, when the gas has undergone the usual wet or dry lime purification.

The gas is conducted into a circular vessel, constructed like those in use for the purpose of washing gas, and lined with lead, that metal not being acted upon by sulphuric acid; it is divided at the bottom into a number of sections, 8 inches or 10 inches in height, which support a lead plate, covering the whole surface of the vessel, except about 5 inches round the edge. The vessel is charged, up to the height of the plate, with water, to which oil of vitrol, at the rate of about 2½lbs, or thereabouts, of acid, to 100 gallons of water, has been added; the gas is then passed under the leaden plate, where the divisions, by which it is supported, completely separate the gas, and bring each portion of it into contact with the acid solution. The ammonia contained in the gas, combines chemically with the sulphuric acid, and forms sulphate of ammonia. But the acid being thus constantly in process of neutralization, the solution would soon lose its power of separating the ammonia from the gas, but for a small reservoir of sulphuric acid, which being carried into the vessel by means of a pipe furnished with a stop-cock, insures a regular supply of acid. The gas thus freed from ammonia, is carried to the dry lime purifiers, which with this process can always be used. In large

works, two vessels of this kind are preferable for passing the gas twice over the weak solution of sulphuric acid, which secures a more absolute certainty of the extraction of all the ammonia, should there have been any accidental or temporary deficiency of acid in one of the vessels.

Two vessels of 10 feet diameter and 3 feet deep will purify 500,000 feet of gas every 24 hours, and making that quantity, will require to be charged with the acid solution about every two days.

In order to prevent too great a strength of free acid in the vessel, which would precipitate the carbon of the gas, and diminish its illuminating power, the liquor may be tested with the common ammoniacal liquor of the gas-works.

When the solution in the vessel has become of the specific gravity of 1170, or thereabouts, as ascertained by the hydrometer, the supply of acid is to be shut off, and the gas is passed through the vessel, until that solution will restore the color to reddened litmus paper.

The liquor thus obtained is evaporated, and produces sulphate of ammonia of remarkable purity, and of such strength, that one gallon produces 80 ounces of sulphate of ammonia, instead of the 14 ounces only, which are produced from the ordinary ammoniacal liquor of the gas-works. And this last-mentioned liquor must first undergo the process of saturation with sulphuric acid before evaporation.

The same degree of purification of gas from ammonia, may be obtained, by means of chloride and sulphate of manganese, or chloride and sulphate of zinc, which salts are afterwards reproduced, to be used again and again in the same process.

In the ordinary mode of purification, the gas was conveyed directly from the condensers to the wet lime purifiers; a considerable pressure on the retorts was requisite to force the gas through the fluid lime, and thus a loss of gas ensued, with a larger incrustation of carbon in the retorts, and extra labour was necessary for agitating the liquid lime, and for conveying the refuse liquor to be evaporated. This being effected in pans, placed under the retort furnaces, the sulphur given off tended to destroy very rapidly the iron retorts, which were exposed to the action of the flame. The wet lime purified the gas from the sulphuretted hydrogen, a great portion of the hydro-sulpheret of ammonia, the sulpho-cyanuret of ammonia, and the carbonic acid; but it still allowed a considerable quantity of ammonia and its compounds, to pass into consumption with the gas.

The dry lime purifiers used without this process, presented some advantages to the gas companies, over the plan of purifying with wet lime; but it was only in open places in the country that the dry lime could be used, without the works becoming a public nuisance. The objection to dry lime purifiers arose from this cause: the hydro-sulphuret of ammonia, which is generated with carburetted hydrogen gas, is highly volatile, and that portion which is extracted by the lime, having no chemical affinity fo

lime, but being merely held in mechanical combination, had a strong tendency to fly off.

The hydro-sulphuret of lime, is formed in the dry lime purifier, from the sulphuretted hydrogen of the gas; on the opening of the vessel, it rapidly combines with the oxygen of the atmosphere, and becomes converted into sulphate of lime. During that conversion, heat is rapidly evolved, which renders the hydro-sulphuret of ammonia, extracted from the gas by the lime purification, more volatile than ever, and the most offensive stench is the consequence. Besides, so noxious is this gas, that a comparatively small portion of it, in a given volume of atmospheric air, would render it destructive to animal life.

These obstacles would warrant the almost universal abandonment of dry lime purifiers; now, however, in connexion with this process of purifying gas from ammonia, the dry lime purifier will, it is anticipated, become the only system used for the abstraction of the sulphuretted hydrogen. The gas purified from all ammonia, by passing over the solution of sulphuric acid, has only to be freed, by the dry lime purifier, from the sulphuretted hydrogen, the sulpho-cyanuret, and the carbonic acid, which form, in chemical combination with the lime, the hydro-sulphuret of lime, cyanuret of lime, and carbonate of lime, neither of which are volatile, but are highly valuable for agricultural purposes.

In those instances in which the localities have permitted gas companies to continue the use of dry lime purifiers, the value of the products as manure has been so well understood, that the refuse lime has been bought up as fast as it was produced; and an impression having prevailed, that this refuse lime owed its value to the presence of ammonia, some of the contractors of such gas-works have expressed an apprehension that the adoption of this process, by previously abstracting the ammonia, would destroy the valuable properties of this lime.

It is evident that this is entirely a misapprehension. The chemical causes before detailed will have shewn, that the hydro-sulphuret of ammonia, which had been extracted from the gas in the dry lime purifiers, having been volatilized and lost, long before the refuse lime (then become sulphate of lime) could have been taken from the works; the value of the lime really consisted in the fertilizing power of the sulphate of lime, and of the cyanuret of lime. This power will still exist in the same products, concurrently with the use of this process, while the noxious exhalations, which formerly occurred on the opening of dry lime purifiers, will be absent.

In manual labour alone, the Chartered Gas Company have effected a saving, at their Brick-lane station, of between £400 and £500 a-year, by the use of dry lime instead of wet lime purifiers.

Against these many advantages, however, it is proper to mention, that there will be a slightly increased quantity of lime required, in purifying with dry instead of wet lime; for a bushel

of lime in the wet process purified from 18,000 to 20,000 feet of gas, while in the dry lime process the same quantity will only purify 14,000 feet; but this trifling drawback on the dry lime process does not render the comparative merits of the two processes in any degree doubtful.

Various plans have been tried, at different times, to separate the ammonia from the coal gas by means of acids, but either from their expense, or their complication and practical difficulty, or from their effect in diminishing the illuminating power of the gas, all of them have been successively given up as useless. But by this process, all those difficulties are avoided, whilst numerous positive benefits have resulted. The process has been adopted by the Chartered Gas Company, the Imperial, and Phœnix Gas Companies in London, and by several gas companies in the country; and several of the other metropolitan companies have the subject of its adoption under their consideration.

In addition to the advantages arising from the use of the dry lime in place of the wet lime purifiers, which this process renders everywhere possible, the saving which will accrue upon the meters and fittings of the Chartered Gas Company, by the abstraction of the ammonia from the gas, will amount to a considerable sum annually.

At the Brick-lane station, the number of meters requiring repair has already been reduced by one-half, and those annually condemned have been two-thirds less, since this process has been adopted, although an increase of meters has taken place. The public lamp fittings requiring repair, since its adoption, have also been two-thirds less in number than previously. A large saving in wear and tear has thus been effected by the plan. In addition to the above, the illuminating power of the gas has been increased upwards of 5 per cent., by its freedom from ammonia, and it may now be consumed in the drawing-room or bed-chamber with as little inconvenience or effluvium as a wax candle.

In addition to the advantages already enumerated, this process comprises another, fully equal, if not superior, to all the rest. This consists in fixing and neutralizing the ammonia in combination with sulphuric acid, and making it available, in the form of the valuable product of sulphate of ammonia.

Already many tons are produced weekly from the works which have adopted this process, and the purity of the product has been sufficiently attested. It is unnecessary to enumerate the various manufactures and arts in which the sulphate of ammonia is useful and necessary; but the author draws attention to its value for agricultural purposes, a subject upon which many men of science, education, and capital, have for several years past bestowed so much attention.

Next to the mechanical operations upon land, such as complete drainage, and the more perfect disintegration of the soil, which are conditions necessary for improved culture, and a high degree of fertility, there is nothing so important to successful farming as the selection and right application of manures. This, chemistry

alone can teach; and accordingly we find that chemistry is now universally studied with reference to agriculture, by all agricultural improvers; and the knowledge which a Liebig, a Johnston, or a Henslow have attained and tested by experiment, is being diffused throughout our rural districts.

The object of the skilful husbandman is not merely to produce quantity, but he must have quality also; he must be certain that he is growing the peculiar productions he desires, in their most complete state, and at the least comparative expense. It is known, that plants cannot attain maturity, in the richest vegetable mould, without the presence of nitrogen. Liebig says—" Every part of the organism of a plant contains nitrogen, the roots and seeds being particularly rich in that element; and as there cannot be a doubt but a soil must gradually lose those of its elements which are removed by the plants raised upon it, but which, if the land is to be kept in a permanent state of fertility, must be supplied in the form of manures possessing the elements which have been so abstracted."

This fully and scientifically explains that which has long been matter of daily observation, namely, that the so frequent repetition of grain crops speedily exhausts most land. The nitrogen taken away in the form of corn has become deficient, and must be supplied by the extraneous aid of manure, or less perfectly, through the slow operation of the atmosphere.

The first enquiry for the farmer, therefore, is that asked by Liebig, "How and in what form does nature furnish nitrogen to vegetable albumen, and gluten to fruits and seeds?" The question is susceptible of a very simple solution.

" Plants, as we know, grow perfectly well in pure charcoal, if supplied at the same time with rain-water. Rain-water can contain nitrogen only in two forms, either as dissolved atmospheric air, or as ammonia, which consists of this element and hydrogen. Now the nitrogen of the air cannot be made to enter into combination with any element except oxygen, even by the employment of the most powerful chemical means. We have not the slightest reason for believing, that the nitrogen of the atmosphere takes part in the processes of assimilation of plants and animals; on the contrary, we know that many plants emit the nitrogen which is absorbed by their roots, either in the gaseous form, or in solution in water. But there are, on the other hand, numerous facts, shewing that the formation in plants of substances containing nitrogen, such as gluten, takes place in proportion to the quantity of this element which is conveyed to their roots in the state of ammonia, derived from the putrefaction of animal matter."

" Ammonia too, is capable of undergoing such a multitude of transformations, when in contact with other bodies, that in this respect it is not inferior to water, which possesses the same property in an eminent degree. It possesses properties which we do not find in any other compound of nitrogen: when pure, it

is extremely soluble in water; it forms soluble compounds with all the acids; and when in contact with certain other substances, it completely resigns its character as an alkali, and is capable of assuming the most various and opposite forms. Formate of ammonia changes, under the influence of a high temperature, into hydrocyanic acid and water, without the separation of any of its elements. Ammonia forms urea with cyanic acid."

The same eminent chemist subsequently shews, most conclusively, that the ammonia, from which alone vegetables derive their nitrogen, is supplied by means of rain-water from the atmosphere, or by the use of manures containing that gaseous fertilizer. That ammonia, which, from its volatile character, is constantly escaping into the atmosphere, from its great solubility in water, quickly descends with the rain to reproduce abundant vegetation; and that all manures owe their degrees of fertilizing power, in a great measure, to the amount of ammonia they contain.

But when we remember to what an extent the loss of nitrogen takes place; that the liquid and solid excrements of each individual, amounting, on an average, to 1½ lb. daily, and containing 3 per cent. of nitrogen, or about 16 lbs. per annum, are almost entirely lost; and that each man carries to the grave with him nearly 3 lbs. of nitrogen, it will be obvious that the soil from whence man's food is drawn, cannot be supplied with sufficient nitrogen from the atmosphere alone. Hence in practice we see, that each farm is always in the course of improvement or deterioration; there is no neutral condition for the farmer, he must go on or fall back. The good farmer purchases artificial manures, maintains large flocks and herds, often fed on corn, oil-cake, and other food rich in nitrogen; constructs tanks for the reception and preservation of liquid manure, which contains far more ammonia than the solid excrements of animals; and under such treatment he finds his fields, year by year, increasing in fertility, and himself growing in wealth; while the bad farmer sows, reaps, and sells, with grasping eagerness, all the grain he can obtain, without cattle, without sheep, or with such as he may have in a half-fed state; he tries no foreign manure, he uses no artificial food, and after a few years of struggle with what he designates "bad times," he finds that his land will scarcely return seed for seed, and he is a ruined man.

The agricultural chemist would describe this contrast, which involves much of human happiness and misery, by the simple statement that the one man is constantly adding ammonia to his land, and the other is as constantly abstracting it.

Such and similar considerations, which will naturally occur to the reflecting mind, shew the important influence of a process in the advancement of husbandry, which can furnish a vast supply of ammonia in a form and at a cost which brings it within the reach of the humblest agriculturist, from a source previously unfruitful. It forms literally a new mine of wealth, drawn from

the exhaustless coal formation of the earth's former vegetable productions.

A chemical analysis of the sulphate of ammonia, produced by the evaporation of the saturate-sulphate liquor, before described, as drawn off from the purifying vessels, shews it to be of great purity, as it affords in 100 parts nearly 30 parts of ammonia, after deducting water and sulphuric acid, equivalent to about 24 parts of nitrogen. This shews a fertilizing power two or three fold greater than any other manure.

Actual experiments have corroborated the conclusions of the analytical chemist, and some of the most accurate of these are recorded by Mr. W. M. F. Chatterley, at the Manor Farm, Havering-atte-Bower, in Essex, occupied by Collinson Hall, Esq. These were made in 1842, a season which, like the present, (1844,) was, from its dryness, by no means favourable to top dressings.

A field of wheat, which, at the latter end of April, had presented a very thin plant, was dressed on the 12th May with sulphate of ammonia, nitrate of soda, and nitrate of potash. In August, four equal portions of the field were measured.

No. 1, which had received no manure, produced per acre 23¾ bushels of wheat, weighing 1413 lbs. = 59½ lbs. per bushel; and 63½ trusses of straw, weighing 2287 lbs.

No. 2, had been dressed with 1¼ cwt. of sulphate of ammonia, at a cost of £1. 1*s.* 9*d.* per acre. The produce of the acre was 32¾ bushels of wheat, weighing 1999 lbs. = 61½ lbs. per bushel, and 71½ trusses of straw, weighing 2571 lbs.; shewing an increase of 9 bushels of wheat and in money profit of £1. 16*s.* 9*d.* per acre.

No. 3, had been dressed with 1 cwt. of nitrate of soda, costing £1. 14*s.* 6*d.*; it produced 31½ bushels of wheat per acre.

No. 4, had been dressed with 1 cwt. of nitrate of potash, costing £1. 7*s.* 6*d.*; the latter also produced 31½ bushels per acre.

The experiments shew a considerable advantage from using the sulphate of ammonia, and mark still more distinctly the benefits derived from supplying the wheat plant with the nitrogen it requires, in the form of ammonia. It will be remarked, that the weight of the wheat, the grand test of its quality, was increased by the use of sulphate of ammonia, and this alone would add at least 1*d.* or 2*d.* per bushel to the selling price. Other experiments might be detailed, bnt they have all shewn very similar results. 200 lbs. of sulphate of ammonia applied in 1843 to poor grass land, by Mr. Bower, of West Dean House, produced an increase of 10 cwt. of hay per acre.

The result of all the experiments, however, seems to shew, that 1 cwt. of sulphate of ammonia per acre, whether applied to grain or to grass crops, gives a maximum of profit for the outlay.

There is still another form in which ammonia may be used for supplying nitrogen to plants, which has been attended with so much success, that it must be mentioned. It is by steeping the

seeds in a solution of sulphate of ammonia. An account of an actual experiment is given in the *Mark Lane Express,* of the 27th of May, 1843. The results there stated, accord very closely with the experiments made under the author's own observation. The writer says—"I steep the seeds in sulphate, nitrate, and muriate of ammonia, in nitrate of soda and potash, and in combinations of these, and in all cases the results were highly favourable. For example, seeds of wheat steeped in sulphate of ammonia on the 5th of July, had, by the 10th of August, tillered into nine, ten, and eleven stems, of nearly equal vigour; while seeds of the same sample, unprepared, but sown at the same time in the same soil, had not tillered into more than two, three, and four stems."*

These facts are decisive as to the value of the process, with reference to agriculture. It must be recollected also, that by the application of this process, one ton of sulphate of ammonia may be produced from every million cubic feet of coal gas generated, and that the quantity so obtained will dress 20 acres of wheat; producing thereby a clear profit of £1. 15*s*. per acre, or £35.

The total yearly quantity of coal gas made in London has been estimated at 2400,000,000 of cubic feet; whence some idea may be formed of the amount of sulphate of ammonia which this process may render available for the purposes of agriculture.

It should be observed also, that this quantity is over and above that ammonia which was, and still is, obtained from the common amoniacal liquors of the gas-works; and that the process which enables such agricultural benefits to be secured, effects at the same time a considerable saving in the manufacture of gas by the companies which have adopted it; while the use of coal-gas for the purpose of illumination, from its being rendered more agreeable and healthy, will be greatly extended in all private families.

The paper is illustrated by two drawings (Nos. 3675 and 3676), by Alfred Upward, Assoc. Inst. C.E. The former represents the section and plan of two acid purifying vats, 10 feet in diameter, by 3 feet deep; with the leaden plate, the pipes for respectively supplying acid and water, and discharging the sulphate liquor, and the inlet and outlet pipes for the gas, as well as shewing the mode of dividing the bottoms of the vats into sections. The latter shews in detail the dimensions and construction of the dry lime purifiers used at the Brick-lane Gas Station.

Mr. Lowe confirmed the statements in the paper, relative to the advantages of the new system. Formerly, when the dry lime purifiers were used at the Brick-lane Gas station, the health of the men suffered, and the complaints by the neighbourhood, of

* The proportions of the solution used for steeping wheat are 1 lb. of sulphate of ammonia to 1 gallon of water; and the seed should remain in the solution for 24 hours. If the sulphate of ammonia is used for the land when the crop is growing, the proportion is from 1 cwt. to 1½ cwt. per acre, according to the state of the crop.

the nuisance when the lime was changed, were so constant, that the system was abandoned; at present, although ten times the quantity of gas was purified, there was not any nuisance, either in the works, or in the neighbourhood.*

It had been stated, that the system had been used in other places, and that the credit of the invention was not due to Mr. Croll. Although it was not the province of the Institution to enter into such an inquiry, he might perhaps be allowed to state, that a similar plan had been tried at Bristol, at the suggestion of Mr. Herapath; the idea had originated in the same chemical facts which had induced Mr. Croll's attention to the subject, but the *modus operandi* was essentially different. In Mr. Herapath's plan there was not any continuous supply of acid; no valuable product was obtained; it was troublesome and expensive, hence it was not successful, and the plan was abandoned. Mr. Croll had entered upon the subject, with perhaps more practical skill, which, joined to his chemical knowledge, had enabled him to attain the success which attended the present system.

The economy of the process, the diminution of the destructive effects of the purified gas upon the apparatus and the fittings, its increased illuminating power, and its greater fitness for combustion in dwelling-houses, with other advantages, had been fully and fairly stated in the paper.

The chemical products obtained from the process, deserved very careful attention, and their adoption for agricultural purposes was important. The effect of sulphate of ammonia, in assisting vegetation, was remarkable, and it was already extensively used in agriculture. It also revivified cut flowers, when they were apparently withered and dying. Flowers, whose stems were cut diagonally, so that their capillary tubes were not bruised or torn, on being put into a solution of 8 grains of sulphate of ammonia to 1 pint of water, would be speedily restored to vigour, if somewhat faded, and they might be kept fresh by this means for a long period. For watering geraniums and other plants growing in pots, ¼ lb. of sulphate of ammonia should be dissolved in one gallon of water, and a wine-glass of this solution, added to every quart of water; the strength and beauty of the plants was found to be much improved.

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* In a report to the Directors of the Chartered Gas Company, dated November 19th, 1841, Professor Brande says,—"I think it probable that much of that anomalous fetor and penetrating effluvium which infects the gas mains and the soil in which they lie, and which is generally, but, I think, erroneously, merely ascribed to tar and naphtha, is in great part attributable to ammonia and its compounds, and that this nuisance will be found greatly diminished, if not altogether prevented, by passing the gas through dilute acid liquors before it enters the main. Ammonia, and some of its compounds, exhibit penetrating and peculiar reactions upon certain metals, and are also probably concerned in some of those curious phenomena of exosmose and endosmose, which now constitute an important element of the philosophy of gaseous chemistry."

Professor Graham bore testimony to the efficacy of Mr. Croll's process for removing ammonia from coal-gas and to the valuable nature of the products obtained. Looking at the purifying of coal-gas as necessarily founded upon sound chemical principles, he thought, that more attention might still be advantageously paid to several parts of the process.

In the first step of the purification, namely, the proper cooling of the gas, as it escaped from the retorts, he suggested a gradual refrigeration of the gas, or the retaining it for a short time, at an intermediate temperature, such as 212° Fahrenheit, before it was cooled down to the temperature of the air, in the usual refrigerators. The tarry matters in the gas being the least volatile, would thus condense first, and by themselves, at a temperature which, being inadequate to condense the naphtha, would prevent their carrying down with them so much of the valuable naphtha vapour as at present. These tarry matters, having an affinity for naphtha, tended powerfully to de-naphthalize the gas, when in contact with it at a low temperature, and to deprive it of that valuable adjunct for combustion.

The mode of purifying coal gas from sulphuretted hydrogen, by dry lime, was gradually superseding the wet lime process, particularly when the former was used in combination with the acid process. The dry lime, however, was so far disadvantageous, as that it could never be entirely saturated with sulphuretted hydrogen.

Professor Graham had found, that by mixing an equivalent proportion of sulphate of soda with the lime, more than twice the quantity of sulphuretted hydrogen was taken up. The lime was entirely converted into sulphate of lime or gypsum, and the whole soda became bi-hydro-sulphuret of soda, which might be easily washed out of the former. The latter salt might be again converted into sulphate of soda by roasting it; and thus might be used to mix with the lime in the purifiers over and over again. Sulphate of lime, which was the only residue, was valuable for agricultural purposes.

In the distribution of coal gas, every means for counteracting the porosity of the pipes should be adopted. In experiments upon cast iron gas-pipes, he had found as much as 25 per cent. of atmospheric air, mingled with the coal gas, which had been in the mains for 12 hours. This arose entirely from the porosity of the metal; air entering by the diffusive power of gases, although the coal gas in the main was under a small pressure. This should be guarded against, not only on account of the positive loss of gas which it indicated, but because, as was well known, a moderate proportion of atmospheric air mixed with the gas, greatly diminished its illuminating power.

Mr. Bethell said, that his attention had been directed to the use of chemical agents for agricultural purposes, by a notice in the journals, of the professions of a German chemist, to obviate the

necessity for manuring corn land. Mr. Bethell, in consequence, tried various solutions, in which seeds were steeped for 40 hours; they were then sown in different patches of unmanured land, and he found, that although with some of the seeds which had been in other solutions, vegetation was more rapid, yet that the produce of the seed which had been steeped in a solution of 1 lb. of sulphate of ammonia to 1 gallon of water, was more vigorous and prolific, and that during a dry season, when all the other wheat became yellow, the plants from the steeped seed remain green.

Mr. Simpson stated, that in connexion with the subject of gas-making, the porosity of the iron pipes, through which it was circulated in the street, should be noticed. He believed that formerly, considerable quantities of pipes had been laid without their being previously proved; and even now, experiments he had made convinced him, that few pipes were not in some degree porous. When they were proved with water, under a heavy pressure, and a mirror was placed near the surface of the metal, a damp film showed the permeability; and after the pressure had been continued for some time, the exudation of moisture was very visible. Oxydation would, to a certain extent, close the pores of the metal and prevent this effect, and he would suggest, that all pipes should be proved with a solution of sal-ammoniac, which being forced into the body of the metal, would effectually oxydize it, and to a great extent cure the evil. He felt convinced, that 25 per cent. of the gas was lost, from the leakage of the pipes and the joints; and in opening the streets, the difference between the gas and the water pipes was immediately perceived, by the soil around the former being saturated with gas.

Mr. Simpson quoted an instance where, in a length of 1000 yards of iron pipes 2 inches in diameter, there had been a loss of 357 cubic feet of gas in 24 hours. By perseverance in repairing the escapes, the porous spots and other defects in the metal of the pipes, the leakage had been reduced in three years to about 13 cubic feet in 24 hours.

Mr. Lowe said, that although in the early stages of gas-lighting, the pipes laid in the streets might not have been proved, such was not now the case; at present all were severely tested, and great attention was paid to the formation of the joints, which were made by ramming in layers of gasket, previously soaked in hot pitch and tallow, then running in the lead, and after that was well driven up with a caulking-iron, the joint was smeared over with pitch.

The gas companies were fully aware of the loss they had sustained from defective pipes and bad jointing, and every attention was now given to the subject. Some time since, Mr. Lowe had been called upon to examine a provincial gas-work, where, although the consumers paid by meter, and an allowance of 6 cubic feet of gas per hour was made for each public light, 75 per cent. of the gas which was manufactured, was not accounted for.

On examination, it was found, that from the ignorance of the superintendent, a pressure of 2 inches of water was kept constantly by day upon the pipes. The process of exosmose was thus carried on to an enormous extent. As soon as the pressure was diminished, the loss was reduced in proportion, and when, by his advice, the gas was allowed for a time to pass into the pipes in a less pure state than usual, the leaks were soon discovered and repaired. It was certain, that the process of endosmose and exosmose was constant with gas-pipes, as the cast-iron was of a porous and cellular texture; and he believed, that a great portion of the loss arose from this permeability of the metal. He noticed, on opening the streets, that the soil in contact with the whole length of the gas-pipes, was saturated with gaseous products, and not merely those spots near the joints.

Mr. Murray remarked, that Mr. Hague had found great difficulty in remedying the permeability of cast-iron, when he attempted to work his engine with condensed air; it was only by coating the pipes with a mixture of tallow and pitch, that he succeeded in rendering them partially impermeable.

Mr. Farey observed, that the porosity or permeability of cast-iron was a well-ascertained fact. This first came to his knowledge many years ago, in the case of a hydrostatic or Bramah's press, wherein the water, when very forcibly compressed, made its way slowly through the thick cast-iron cylinder by a sort of perspiration at the external surface, so that the press relaxed its pressure, and the plunger descended considerably during the night, after a large package of elastic goods had been left in it, under strong compressure in the evening. The external surface of the cast-iron cylinder was found the next morning covered with very minute drops of water, particularly towards the lower end, where the drops were larger. Before this exudation of the fluid was observed, the workmen said, the water had leaked out at the leathering around the plunger, or at the joints, but as a considerable quantity of water must have leaked, in order to have so much relaxed the press, and as little or no water shewed itself at the leathering, or joints, further search was made, and the real cause was discovered; but as only very little water had dripped down on the ground, it had probably evaporated in the air, nearly as fast as it exuded, in a state of minute division.

It was remedied by withdrawing the plunger, warming the cylinder over a fire of shavings, and lining the interior surface, when warm, with a mixture of melted bees'-wax and resin, forming a thick varnish. The press stood well afterwards, and the case shewed, that leather, not thicker than the sole of a strong shoe, was less permeable to cold water, under great pressure, than cast-iron of some inches in thickness.

On mentioning the circumstance to the late Mr. Maudslay, he said, that whilst he was engaged with Mr. Bramah, and made the small hydrostatic presses for copying letters, he observed that

some of the cylinders permitted the water to exude through the gun-metal, which was a composition of copper and tin, from which they were cast. By watching the proceedings of the workmen who poured the melted gun-metal into the moulds, which were placed in an inclined position for the convenience of receiving the melted metal, Mr. Maudslay observed, that immediately after the pouring, it was a habit with the workmen to set the moulds upright with a sudden motion. This Mr. Maudslay thought might disturb the metal at the moment of its solidification, and after prohibiting that practice, and leaving the moulds quite at rest, until the metal must have become completely set, the cylinders generally proved sound.

As to cast-iron, it was not always a close-grained metal; the carbon, which it contained, and which constituted its difference of substance from pure malleable iron, pervaded the mass, divided into minute particles, which kept the molecules of iron apart, and impaired their cohesion. Such cast-iron was very fusible, ran well into the moulds, and was soft for working with tools. It was called No. 1, rich iron, of best quality, for foundry metal; it was also called 'kishy' iron, from an appearance of particles of carburet of iron, or black lead, on its surface, after the iron had been left to cool in the open air. That was accounted for, by supposing that the iron absorbed more carbon from the fuel, in the blast furnace, whilst it was in the fluid state, than the same iron could retain when it afterwards cooled and solidified; and that the molecules of iron in approaching each other, during the solidification, expelled a portion of the excess of carbon from between them, with a curious vermicular motion, which could be observed, on the surface of the melted metal, whilst it was cooling; and it was the carbon which was so expelled that shewed itself in those particles of carburet, after the iron was cold.

That vermicular motion must be inimical to the future solidity of the metal, and such kishy metal, although soft for working with tools, was in fact deficient in cohesion; it did not make strong castings, was unfit for wearing to resist friction, and was porous to gas, air, and water under pressure.

It was only by causing cast-iron to absorb carbon slowly from the fuel, in the blast furnace, that it could be wholly freed from the oxygen, with which the iron was combined, when it was in the state of ore; and the more carbon that was so absorbed, the more completely the oxygen was got rid of.

At least that was the case in the ordinary process of smelting iron with cold blast, by a slow process of such absorption; but the hot blast process appeared capable of inducing a very rapid absorption of carbon, by a mass of cast-iron in the blast furnace, which rapid absorption was not attended with such a complete deoxydation of the iron, as would take place with a less absorption of carbon, by a slower process of such absorption in the cold-blast process. Probably by the hot-blast process, when urged

too rapidly, some portions of the cast-iron contained in the furnace, were very completely deoxydated, and had absorbed such a great excess of carbon into the interstices between them, as would keep the molecules of metal apart, and impair their cohesion, whilst other portions of the same mass of iron might remain imperfectly deoxydized, and for want of time, had not absorbed their proper share of the carbon, which was contained in the mass generally; such imperfectly deoxydized particles would be deficient in cohesion for want of complete metallization.

These suppositions might serve to explain, why hot-blast iron having the character of rich kishy iron, was so deficient in cohesion, but by allowing more time for the smelting operation, hot-blast iron might, he conceived, be made of excellent quality.

Cast-iron which was rich in carbon, might be made to part with so much of its excess of carbon in re-melting as to acquire a full cohesion; and such excess might be neutralized, by melting the rich iron along with a suitable proportion of old castings, which by previous meltings had been deprived of their excess of carbon. Messrs. Boulton and Watt, at the commencement of their career, paid great attention to that subject for the casting of cylinders, and other parts of their steam-engines, and by availing themselves of all that had been learned in the casting of iron cannon, and by the judicious mixture of different sorts of cast-iron in the operation of the foundry, they obtained castings which have never been excelled, and rarely equalled, for solidity and strength.

Cast-iron of that first-rate quality had the molecules of metal in close contact; hence their cohesion was great, and the metal was impervious to water, gas, or air.

Respecting the leakage of gas from cast-iron pipes, a very large proportion proceeded from the joints of the lengths of pipes. At Manchester it had been the custom for several years past, to form the joints of cast-iron pipes, by boring and turning the ends to fit truly one into the other, and very recently Mr. Hick, of the firm of Forrester and Co., at Liverpool, had shewn him a machine which performed the operation of both boring and turning the two ends of a pipe very rapidly. It was a slide lathe bed, having two head stocks with strong mandrils, fixed upon it, one near each end; they were placed at such a distance asunder on the bed, as to receive the length of the pipe between them; each mandril had a chuck upon the end of it, with notches into which steel cutters were wedged, like a boring head. One such chuck was adapted for boring out the interior of the socket end of the pipe to a suitable cone; the other chuck had its cutters set for turning the exterior, at the other end of the same pipe, to a corresponding cone. The pipe was fastened down on a sliding carriage, so as to present first one end of it to one chuck, and then the other end of it to the other chuck, by which means the whole operation was very expeditiously and perfectly performed. This mode of

preparing pipes was becoming common in Liverpool and Manchester, and was, he thought, deserving of more general adoption.

Mr. Cooper reminded Mr. Lowe of an experiment at which he was present a few years since, where the process of endosmose and exosmose was shewn very strikingly. A bag formed of two sheets of paper, pasted together all around the edges, was inflated with coal gas, by introducing a quill at one corner; in 10 seconds it was discovered, that the gas had entirely escaped, and its place was occupied by common atmospheric air, although no visible defect existed in the bag.

He thought, that the soft and porous quality of the iron, of which the pipes were made, for the convenience of drilling and tapping them, for the service branches, conduced to the process and consequent loss of gas.

Mr. Croll's system would, Mr. Cooper thought, be of much benefit, not only to gas companies, but also to manufactures generally, by reducing the cost of ammonia. Some years ago the price of sal ammoniac was 3*s.* per lb. for a quality inferior to that which was now sold for 6*d.* per lb. This reduction was entirely owing to the increase of gas lighting, the products being converted into this useful salt.

Among the manufactures in which sal ammoniac was used, was that of tinning and zincing iron: it floated in a liquid state, upon the fluid metal, preventing oxydation, and the plate traversed it before it reached the metal, when it was plunged in the bath of tin or zinc.

The President observed, that Mr. Croll's paper was so important in its character, and the new process had been so fully and liberally described, that an obligation had been conferred, not only on the Institution, but towards the public, by its production. It was an additional proof, if such were wanting, of the intimate connexion of engineering with all the useful arts. From the purifying of gas, for domestic consumption, the transition was, it appeared, inevitable to the consideration of the chemical products of the process; and their influence on agriculture and horticulture, and the facts developed, were most interesting. He hoped that this discussion would prove an additional inducement to members, or to those who felt any interest in science, to bring forward papers at the meetings; as, during their discussion, useful facts would most probably be elicited.

In his connexion with the conservancy of the river Thames, his attention had frequently been directed to the nuisance, arising from the products of purifying, flowing from the gas-works into the river. He believed, that the ammoniacal liquor was one of the most noxious of these products, and it would be no inconsiderable benefit, if by the adoption of this new system, by using dry lime instead of wet lime purifiers, this nuisance could be even abated, if not finally got rid of.

LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

1845.

July 31. *William Leschallas*, of 32, Budge-row, for an envelope fermée.

Aug. 1. *John Hopkins*, of 18, Brand-street, Greenwich, for a chimney-pot and ventilator.

5. *Thomas Beaney*, of St. Leonard's-on-Sea, in the county of Sussex, for springs for carriages.

7. *Elizabeth Furtardo*, Widow, of 51, Wigmore-street, Cavendish-square, for a symmetrical boddice.

9. *Richard Lynex*, of 35, Legge-street, Birmingham, for a chain for lamps, and other purposes.

12. *William Wharton*, foreman of the London and Birmingham Railway, Euston Station, London, for a lubricating shield for journals.

12. *George Lee*, of 45, Burgess-street, Sheffield, for an improved form of handle for table knives and forks, to be called "Prince Edward's Pattern."

13. *S. Mordan & Co.* of 22, City Road, London, for a new revolving-top patent ever-pointed pencil.

13. *Donald Grant*, of Southampton-street, Strand, for a ventilating double chimney gas lamp or chandelier.

14. *Samuel Brittall*, of Lancaster-street, Birmingham, for the defiance sash fastener.

14. *Edward Collins*, of Moland-street, Birmingham, for an improved spindle and guide for turn button, locks, &c.

14. *Rock, Brothers, & Payne*, of No. 11, Walbrook, London, for an improved letter-clip.

15. *Joseph Richards*, near Beverley, iron works, Beverley, Yorkshire, for a heating furnace.

15. *F. Butler*, of 41, Sussex-street, London University, for a fire-escape.

15. *William Gore Pearce & Isaac Simmons Couran*, both of 2, Edwin-place, Peckham New Town, for the newly-invented letter-box.

18. *W. Chesterman*, of Wraxall, near Bristol, for a portable steam-cooking apparatus.

Aug. 21. *Joseph Bunnett*, of 26, Lombard-street, London, for a railway signal.

22. *William Rimell*, of King-street, Hammersmith, for a quick boiling tea-kettle.

23. *George Henry Faulkner*, of Falcon Works, Manchester, for an expanding boring tool.

List of Patents

That have passed the Great Seal of IRELAND, to the 18th of August, 1845, inclusive.

To George Mitchell, of Grafton-street, in the city of Dublin, confectioner and importer of American ice, for a new and improved construction of building for housing, storing, keeping, and preserving ice from heat and air, and from any other consequence, whether from atmospheric or other causes destructive of or calculated to injure said commodity.—Sealed 28th July.

Stephen Bencraft, of Barnstable, Esq., for improvements in the construction and fitting up of hames for the prevention and cure of galled shoulders of draught-horses.—Sealed 28th July.

Lawrance Halker Potts, of Greenwich, in the county of Kent, for certain improvements in piers, embankments, breakwaters, and other similar structures, which improvements are applicable to working under water or on the land, and for other purposes. —Sealed 31st July.

Auguste Chèrot, of Nantes, in the kingdom of France, spinner, for an invention of certain improvements in machinery for spinning flax, hemp, and other fibrous materials,—being a communication.—Sealed 2nd August.

John Kingsley Huntly, of John-street, Minories, in the city of London, merchant, for improvements in the manufacture of manure,—being a communication.—Sealed 5th August.

Henry Jones, of Nos. 36 and 37, Broadmead, in the parish of St. James, in the city of Bristol, baker, for a new preparation of flours for certain purposes.—Sealed 5th August.

Frederick Herbert Maberly, of Suffolk, clerk, master of arts, for certain improvements in machinery or the apparatus for stopding or retarding railway and other carriages, applicable also for these purposes in regard to other engines.—Sealed 8th August.

List of Patents

Granted for SCOTLAND, subsequent to July 22nd, 1845.

To Thomas Grubb, of Dublin, civil engineer, for improvements in bank notes, and in machinery connected therewith, parts of which are also applicable to cheques, bills, and other documents.—Sealed 23rd July.

William Yates, of Manchester, in the county of Lancaster, upholsterer, and Dennis Dolan, of the same place, scagliola manufacturer, for certain improvements in plastic manufacture or composition, part of which is applicable to decorative and useful purposes, and part as fire-proof cement or plaster.—Sealed 28th July.

William Shaw, of Canning-place, Liverpool, in the county of Lancaster, printer and account-book manufacturer, for a machine for paging books and numbering documents consecutively and otherwise, and for printing dates, words, marks, or impressions, in an expeditious manner.—Sealed 29th July.

Isham Baggs, of Great Percy-street, Claremont-square, in the county of Middlesex, engineer, for improvements in obtaining motive power by air.—Sealed 29th July.

William Pollard, of Newcastle-upon-Tyne, Gent., for certain improvements in the production of combustible gases, and in the application of the same as fuel.—Sealed 30th July.

Richard Simpson, of the Strand, London, Gent., for certain improvements in bleaching yarns and fabrics,—being a communication from abroad.—Sealed 31st July.

William George Henry Taunton, of Liverpool, in the county of Lancaster, civil engineer, for certain improvements in machinery for revolving windlasses, barrels, spindles, shafts, and for pumping.—Sealed 31st July.

William Hannis Taylor, of Piccadilly, in the county of Middlesex, Gent., and Thomas Bartlett Simpson, of Great Russell-street, in the same county, Gent., for certain improvements in propelling.—Sealed 5th August.

Thomas Clarendon, of No. 213, Great Brunswick-street, in the city of Dublin, Gent., for an improved method of shoeing horses and other beasts of burden,—being a communication from abroad.—Sealed 5th August.

John Macintosh, of Glasgow, Gent., for improvements in preparing materials for coloring and printing calicos and other fabrics, and improvements in printing and ornamenting fabrics. —Sealed 6th August.

Alexander Wilson, of Glasgow, in the county of Lanark, manager for Alexander Fletcher and Company, flax spinners, Glasgow, for improvements in spinning hemp and flax, and other fibrous materials.—Sealed 6th August.

John Parsons, of No. 2, Stones-row, St. Pancras, in the county of Middlesex, machinist, for certain improvements in the manufacture of fuel, and in apparatus for the use of the same.— Sealed 8th August.

Frederick Herbert Maberly, of Stow Market, in the county of Suffolk, clerk, master of arts, for certain improvements in machinery or the apparatus for stopping or retarding railway or other carriages; applicable also to these purposes in regard to other engines or wheels.—Sealed 8th August.

Elias Robison Hancock, of No. 16, Regent-street, in the county of Middlesex, Esq., for certain improvements in mechanism applicable to turn-tables for changing the position of carriages and engines on railways; which improvements are also applicable to cranes and other purposes.—Sealed 8th August.

William Young, of Paisley, manufacturer and dyer, and Archibald M'Nair, of the same town, merchant, for certain improvements, in the construction and means of manufacturing apparatus for conducting electricity.—Sealed 12th August.

Geoge Bell, of Pembroke-road, in the city of Dublin, merchant, for certain improvements in drying malt, grain, and seeds.— Sealed 12th August.

Hugh Cogan, of West George-street, Glasgow, in the county of Lanark, merchant and manufacturer, for an improved method or methods for weaving in patterns, or various colors, or fabrics. —Sealed 20th August.

William Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in machinery to be employed in the manufacture of nails, rivets, screws, and pins,—being a communication from abroad.— Sealed 20th August.

James Ivers, of Preston, in the county of Lancaster, machine-maker, for certain improvements in machinery or apparatus for preparing, roving, and slubbing cotton, wool, and other fibrous substances.—Sealed 21st August.

William Breynton, of the Inner Temple, in the city of London, Esq., for certain improvements in rotary steam-engines.—Sealed 21st August.

William Eccles and Henry Brierley, both of the township of Walton-le-Dale, in the parish of Blackburn, in the county palatine of Lancaster, for improvements in the machinery or apparatus used in spinning.—Sealed 21st August.

New Patents

SEALED IN ENGLAND.

1845.

To Richard Archibald Brooman, of Fleet-street, Gent., for certain improvements in dyeing,—being a communication. Sealed 25th July—6 months for inrolment.

William Henry James, of Clements-lane, London, civil engineer, for certain improvements in the manufacture of plates and vessels of metal and other substances, suitable for heating purposes, and in the means of heating the same. Sealed 25th July—6 months for inrolment.

James Stokoe, of Newton, in the county of Northumberland, millwright, for certain improvements in purifying the vapours arising from smelting and other furnaces, and in recovering therefrom any useful matters which may be intermixed therewith. Sealed July 25th—6 months for inrolment.

William Breynton, of the Inner Temple, Esq., for certain improvements in rotatory steam-engines. Sealed 25th July—6 months for inrolment.

Alexander Wilson, of Glasgow, manager for Alexander Fletcher and Co., of the same place, spinners, for improvements in spinning hemp and flax, and other fibrous materials. Sealed 29th July—6 months for inrolment.

John Henry Roberts, of Norfolk Villa, Finchley-road, St. John's Wood, surgeon, for improvements in spirit lamps. Sealed 29th July—6 months for inrolment.

George Beadon, of Battersea, commander in the Royal Navy, for improvements in propelling vessels and land carriages, in raising and drawing off water, for driving machinery; which means of raising and drawing off water are applicable to other useful purposes. Sealed 29th July—6 months for inrolment.

Sir Samuel Brown, of Blackheath, Knt., Captain in He Majesty's Navy, for improvements in the formation of embankments for canals, docks, and sea-walls, and in the conveyance and propulsion of locomotive engines and other carriages, or bodies on canals and other inland waters, and also on rail and other roads, and in propelling vessels on the ocean and navigable rivers. Sealed 29th July—6 months for inrolment.

Caleb Bedells, of Leicester, manufacturer, for improvements in weaving. Sealed 29th July—6 months for inrolment.

Ezra Coleman, of the city of Philadelphia, in the United States of America, for improvements applicable to the moving of locomotive engines on inclined planes of railways. Sealed 30th July—6 months for inrolment.

John Paltrineri, of Skinner's-place, Size-lane, London, Gent., for certain new and improved modes of obtaining and applying motive powers. Sealed 30th July—6 months for inrolment.

Joseph Quick, of Sumner-street, Southwark, engineer, and Henry Austin, of No. 10, Walbrook, civil engineer, for improvements in the construction and working of atmospheric railways. Sealed 31st July—6 months for inrolment.

Wiiliam Cook, of King-street, Golden-square, coach-maker, for an improvement in certain descriptions of stoves. Sealed 31st July—6 months for inrolment.

Pierre Armand Le Comte de Fontainemoreau, of Skinner's-place, Size-lane, for certain improved medicines or compounds, and for the application of a new instrument to prevent, alleviate, and cure certain diseases; also for the machinery for manufacturing the said instruments,—being a communication. Sealed 4th August—6 months for inrolment.

William Longmaid, of Plymouth, Gent., for certain improvements in the manufacture of chlorine, in treating sulphurous ores and other minerals, and in obtaining various products therefrom. Sealed 4th August—6 months for inrolment.

Josiah Marshall Heath, of Winchester-buildings, iron-master, for improvements in the manufacture of cast-steel. Sealed 4th August—6 months for inrolment.

William Young, of Paisley, manufacturer and dyer, and Archibald M'Nair, of the same town, merchant, for certain improvements in the construction and means of manufacturing apparatus for conducting electricity. Sealed 4th August—6 months for inrolment.

Charles Henry Joseph Forret, of Lille, in France, but now of 17, Great St. Helens, Bishopsgate, Gent., for a new and improved Archimedean screw, which he calls "Davaines screw",—being a communication. Sealed 4th August—6 months for inrolment.

Alanson Abbé, of Great Russell-street, Bloomsbury, M.D., for improvements in apparatus for preventing and alleviating spinal disorders. Sealed 4th August—6 months for inrolment.

William Eccles and Henry Brierley, both of Walton-le-Dale, Lancashire, spinners, for improvements in the machinery or apparatus used in spinning. Sealed 5th August—6 months for inrolment.

Peter Francis Maire, of Mark-lane, merchant, for improvements in combining iron and other materials for the purpose of constructing bridges, roofs, arches, floors, and other similar structures,—being a communication. Sealed 5th August—6 months for inrolment.

Francis Taylor, of Romsey, Hants, surgeon, for improvements in giving alarm in case of fire, and in extinguishing fire,—being partly a communication. Sealed 6th August—6 months for inrolment.

Frederick Bankart, of Champion Park, Denmark Hill, Surrey, Gent., for certain improvements in treating certain metallic ores, and refining the products therefrom. Sealed 7th August—6 months for inrolment.

John Evans, of Kensington, Gent., for a new perazotic product, and its application to the arts,—being a communication. Sealed 7th August—6 months for inrolment.

Dalrymple Crawford, of Stratford-on-Avon, Warwick, for an improved dibbling machine. Sealed 7th August—6 months for inrolment.

Henry Smith, of Liverpool, engineer, for improvements in the manufacture of wheels for railways, and in springs for railway and other carriages, and in axle-guards for railway carriages. Sealed 7th August—6 months for inrolment.

Henry Emanuel, of Pond-street, Hampstead, Gent., for improvements in atmospheric railways. Sealed 7th August—6 months for inrolment.

George Brown, of Caperthorme, Chester, land agent, for a new seed and manure drill-plough. Sealed 9th August—6 months for inrolment.

Pierre Armand Le Comte de Fontainemoreau, of Skinner's-place, Size-lane, for certain improvements in apparatus for raising and supporting vessels and other floating or sunken bodies, and its application for the better preservation of life and property. Sealed 9th August—6 months for inrolment.

Frank Hills, of Deptford, manufacturing chemist, for improvements in purifying gas for illumination, and obtaining a valuable product in the process. Sealed 9th August—6 months for inrolment.

Charles Searle, of Bath, doctor of medicine, for improvements in stoves. Sealed 9th August—6 months for inrolment.

Peter Higson, of Clifton, Lancashire, mining engineer, for certain improvements in machinery or apparatus for connecting and disconnecting the steam-engine or other motive power, with or from the load or other matter to be driven or moved. Sealed 9th August—6 months for inrolment.

William Newton, of the Office for Patents, 66, Chancery-lane, civil engineer, for improved modifications and novel applications of known machinery and processes to the purpose of cleaning, softening, dividing, and preparing flax, hemp, and other vegetable fibrous materials,—being a communication.—Sealed 14th August—6 months for inrolment.

Thomas Henry Russell, of Wednesbury, Staffordshire, tube manufacturer, for improvements in the manufacture of welded iron tubes. Sealed 14th August—6 months for inrolment.

Hypolite Louis François Salembier, of Mincing-lane, merchant, for improvements in the manufacture and refining of sugar,—being a communication. Sealed 14th August—6 months for inrolment.

Henry Pearse and William Dimsdale Child, both of Finsbury-place, South, for improvements in the manufacture of sugar,—being a communication. Sealed 21st August—6 months for inrolment.

Thomas Oxley, of Westminster-road, civil engineer, for certain improvements in constructing and propelling vessels, and in the machinery connected therewith. Sealed 22nd August—6 months for inrolment.

CELESTIAL PHENOMENA FOR SEPTEMBER, 1845.

D.	H.	M.	
1			Clock before the sun, 0m. 10s.
—			☽ rises 4h. 51m. M.
—			☽ passes mer. 11h. 35m. M.
—			☽ sets 6h. 6m. A.
	9	35	Ecliptic conj. or ● new moon
2	17	48	☿ in conj. with the ☽ diff. of dec. 0. 22. S.
3	9	6	☿ greatest hel. lat. S.
	13	15	♃'s first sat. will im.
4	0	49	♀ in conj. with the ☽ diff. of dec. 3. 52. N.
5			Clock before the sun, 1m. 27s.
—			☽ rises 9h. 31m. M.
—			☽ passes mer. 2h. 40m. A.
—			☽ sets 7h. 40m. A.
	7	28	Vesta in □ with the ☉
7	10	3	♃'s second sat. will im.
9	5	24	☽ in □ or first quarter
10			Clock before the sun, 3m. 8s.
—			☽ rises 2h. 4m. A.
—			☽ passes mer. 6h. 20m. A.
—			☽ sets 10h. 35m. A.
10	15	9	♃'s first sat. will. im.
11	11	39	☿ in inf. conj. with the ☉
12	6		☽ in Perigee
12	9	37	♃'s first sat. will im.
12	19	22	♄ in conj. with the ☽ diff. of dec. 6h. 28m. S.
13			Occul. *c*1 Capricorni, im. 8h. 28m. em. 9h. 39m.
13	10	31	♂ in conj. with the ☽ diff. of dec. 11. 15. S.
14	12	39	♃'s second sat. will im.
14			Occul. *k* Aquarii, im. 7h. 34m. em. 8h. 8m.
15			Clock before the sun, 4m. 53s.
—			☽ rises 5h. 40m. A.
—			☽ passes mer. 11h. 52m. A.
—			☽ sets 4h. 57m. M.
	10	13	Ecliptic oppo. or ○ full moon
			Occul. λ Piscium, im. 13h. 18m. em. 14h. 26m.
16	16	33	♅ in conj. with the ☽
	18	45	♀ in the descending node
18			Mercury R. A. 10h. 58m. dec. 5. 6. N.
—			Venus R. A. 13h. 45m. dec. 10. 57. S.
—			Mars R. A. 21h. 38m. dec. 19. 37. S.

D.	H.	M.	
—			Vesta R. A. 4h. 59m. dec. 16. 13. N.
—			Juno R. A. 12h. 20m. dec. 0. 52. N.
—			Pallas R. A. 19h. 45m. dec. 5. 56. N.
—			Ceres R. A. 22h. 1m. dec. 27. 32. S.
—			Jupiter R. A. 2h. 33m. dec. 13. 33. N.
—			Saturn R. A. 21h. 3m. dec. 18. 1. S.
—			Georg. R. A. 0h. 33m. dec. 2. 48. N.
—			Mercury passes mer. 23h. 4m.
—			Venus passes mer. 1h. 56m.
—			Mars passes mer. 9h. 48m.
—			Jupiter passes mer. 14h. 41m.
—			Saturn passes mer. 9h. 12m.
—			Georg. passes mer. 12h. 42m.
	19	17	♂ stationary
	23	29	♃ in conj. with the ☽ diff. of dec. 2. 9. S.
19			Pallas stationary
	11	31	♃'s first sat. will im.
	21	56	☿ stationary
20			Clock before the sun, 6m. 39s.
—			☽ rises 8h. 7m. A.
—			☽ passes mer. 3h. 12m. M.
—			☽ sets 11h. 2m. M.
21	15	16	♃'s second sat. will im.
22	8	5	☿ in the ascending node
			Occul. *X*2 Orionis, im. 16h. 9m. em. 17h. 33m.
22	16	53	☉ enters Libra,—Autumn commences
23	0	26	☽ in □ or last quarter
24	5		☽ in Apogee
25			Clock before the ☉ 8m. 23s.
—			☽ rises Morn
—			☽ passes mer. 7h. 14m. M.
—			☽ sets 2h. 53m. A.
26	13	25	♃'s first sat. will im.
26	21	38	☿ in Perihelion
			Occul. *k* Cancri, im. 14h. 26m. em. 15h. 25m.
27	4	18	☿ greatest elong. 17. 54. W.
28	7	54	♃'s first sat. will im.
29	17	6	☿ in conj. with the ☽ diff. of dec. 6. 16. N.

J. LEWTHWAITE, Rotherhithe.

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CONJOINED SERIES.

No. CLXVI.

RECENT PATENTS.

To SAMUEL PORRITT, *of Edenfield, in the county of Lancaster, manufacturer, for certain improvements in machinery or apparatus for preparing and carding wool.*—[Sealed 11th January, 1845.]

THESE improvements in machinery or apparatus for preparing and carding wool, consist, firstly,—in a novel arrangement or construction of the feeding-end of the ordinary wool carding engine, and in a particular mode of applying artificial heat thereto, whether by means of chests or chambers, pipes, hollow rollers, or cylinders, heated by steam, hot water, hot air, or otherwise. The principal object of this part of the invention is to effect an economy in the oil which is commonly mixed with the wool, before or between the different processes of opening or teazing, and carding. By the application of this invention, such saving is stated to be very considerable, and a great improvement is also effected in the working of the wool, as by this novel method of applying heat to the wool, whilst on the feed-cloth or fore part of the carding engine, the wool is much softened; the greasy matter generally found in wool, is rendered liquid, and answers instead of oil; and the oil that is used is more thoroughly dissipated

through the mass of wool, which is thereby more readily and evenly wrought, and the fibres freely opened or drawn out, instead of being so liable to injury by being torn asunder or broken up, as in the ordinary machinery.

This first part of the invention is accomplished by the application or employment of a chamber or chest, and a pair of hollow rollers, heated by steam or otherwise, to the feeding-end of the ordinary wool-carding engine, either placed near, or fixed and attached to the engine itself, immediately in front of the feed-rollers, or the "breaker" or "licker-in," or the first carding or main cylinder,—and which may also be applied with great advantage to the machinery used for preparing wool, that is, the "teazer" or "willow," as well as to the "scribbler," or "tummer," and the finishing or carding engine.

Secondly,—these improvements in machinery or apparatus for carding wool, consist in the application or employment of two "doffers," and two fluted rollers, at the finishing-end of the carding engine; which doffers are to be so arranged in the machine, and so clothed with strips of card-teeth, that, both revolving at the same speed, the strips of card-teeth placed longitudinally upon the one doffer, shall be opposite to the spaces left between the strips of card-teeth upon the other doffer, and thus strip or doff all the carded wool brought to them by the main carding-cylinder, instead of allowing that portion of wool which was formerly left on the cylinder, by the spaces between the card-teeth on the doffer, to pass again round the main cylinder, and workers, and clearers. This part of the invention also prevents the cardings being spoiled by the long fibres of wool stretching across the narrow spaces left on the ordinary single doffer, and thereby tying two cardings together; as well as the capability of producing a greater amount of work, in a given time, when compared with the ordinary construction of carding-engines.

The drawings in Plate VII., represent the improvements applied to wool-preparing and carding-engines, of the ordinary construction. Fig. 1, represents a top or horizontal view of a wool carding-engine, as seen from above; and fig. 2, a vertical section, taken longitudinally through about the middle

of the machine. Similar letters of reference are marked upon the corresponding parts of the machine in both the figures. The ordinary and elementary parts of the carding-engine are as follows:—A, A, is the framing of the machine, supporting the breaker, or licker-in roller B, the first main carding-cylinder C, the middle doffing-cylinder D, and the second carding-cylinder E, which are furnished with the working and clearing-rollers F, F, F, and driven by gearing chains and straps in the ordinary way; power being communicated to the fast driving-pulley G. The first part of the improvement is represented at the left hand or feeding-end of the carding-engine; *a, a,* being the ordinary feeding-cloth and rollers, upon which the wool is placed, as usual, on being submitted to the process of carding. Immediately beneath, and in contact with this feeding-cloth, is placed a chest or chamber *b, b,* extending the whole width of the carding-engine, heated with steam, hot-air, or other convenient means; this chest is attached to side guide-plates *c, c,* which support a lid or cover *d, d,* over part of the feed-cloth. *e, e,* are a pair of hollow rollers, also heated by steam, through the pipes *f, f,* between which hollow and heated rollers the wool slowly passes, moving at the rate of the feed-cloth and rollers: either the chest or chamber *b, b,* or the hollow rollers *e, e,* may be used separately, or both together, as may be found preferable.

The patentee states, that he is aware of a heated atmosphere, and other imperfect contrivances, having been adopted during the preparing and carding processes, but not as above described, nor with the effect as before stated; which beneficial effect he has practically accomplished, by the direct application of heat to the wool, after being laid on the feed-cloth, and immediately before entering on the feed-rollers, breaker or licker-in, or the first carding cylinder; and which he claims, whether it be applied by means of an apparatus placed in connection, and made part of the carding-engine itself, as shewn in the drawings, or applied, detached, at or near the carding-engine, for similar purposes. He also claims the application of such apparatus, when used in connection with the machinery for preparing wool, called the teazer or willow, or to the scribbler or tummer.

The second feature of novelty is represented at the right hand or delivering end of the carding-engine; the two doffers being shewn at *g, g,* with their respective combs or bars *h, h,* and fluted rollers *i, i,* for rolling and delivering the cardings alternately into or upon the receiver *k.* The principal novelty in this part of the invention is, the application, employment, or use of two doffing cylinders, and two fluted rollers, instead of one of each, at the finishing-end of the carding-engine; the two doffing cylinders being so arranged in the machine, and revolving at one speed, being connected with the pinion *l, l,* and being so clothed with longitudinal strips of card-teeth *m, m,* that they doff and form into cardings all the wool brought to them by the cylinder B, in consequence of the card-teeth upon the one doffer taking the wool from the cylinder at the time when the space between the card-teeth on the other doffer is passing the cylinder; which peculiar arrangement of doffing apparatus he also claims.—[*Inrolled in the Petty Bag Office, July,* 1845.]

Specification drawn by Messrs. Newton and Son.

To THOMAS KEASLEY, *of Bermondsey, in the county of Surrey, tanner, for his invention of certain improvements in the manufacture of leather; part or parts of which improvements are also applicable to other useful purposes.*—[Sealed 11th January, 1845.]

THIS invention of improvements in the manufacture of leather consists in the construction and employment of certain apparatus, whereby the operation of tanning hides may be more conveniently, advantageously, and effectually carried on than upon the ordinary plan. It is well known to all tanners that the quality and weight of leather is much improved and increased by occasionally removing the hides or skins from the liquor, and exposing them for a short time to the action of the atmosphere. The ordinary plan of doing this is by pulling the hides or skins, one by one, out of the pit, by manual labor, with the assistance of a hooked instrument. This operation takes considerable time, and when the hides are large, is a very laborious occupation. The intention of the patentee is, to employ a machine or apparatus, whereby a much better

result may be arrived at, and at the same time the operation of tanning will be shortened, the labor considerably diminished, and the weight of the leather increased. The apparatus consists of a square, rectangular, or other conveniently-shaped framing, from which the hides or skins are suspended vertically, in any convenient manner. The dimensions of the framing from which the hides or skins are suspended, must, of course, correspond with the size of the pit, so that the frame belonging to each pit, and with it the hides, may be raised or lowered at the discretion of the attendant. Each of these frames, containing the hides, is distinct and separate, and may be raised and lowered, separately, by manual labor, with the assistance of a windlass, if required; but it has been found more advantageous to connect two contiguous frames together, so as to make them counterbalance each other, and thus considerably diminish the labor of working them. A variety of means may be devised for carrying this idea into effect, but in Plate VII., several plans are shewn which will be found to answer the purpose.

Fig. 1, represents a side elevation, and fig. 2, an end elevation of one plan, in which the frames *a, a, a,* filled with hides, or parts of hides *b, b,* are suspended from the extremities of a vibrating beam or lever *c, c,* by means of chains or cords *d, d.* The tan-pits or vats *e, e,* are shewn in section, in both these figures. The beam or lever *c, c,* is mounted at *f,* in bearings firmly fixed in the framing *g, g,* for that purpose, and is worked up and down by means of chains or cords *h, h,* which pass round a windlass or barrel *i, i,* below, and are fastened at either end to the extremities of the vibrating beam. On the axle of the windlass or barrel is mounted a toothed wheel *j,* shewn by dots in fig. 1; it is driven by a pinion *k,* which is fixed on the shaft *l,* and is actuated by applying power to the said shaft, by means of a winch or otherwise. It will now be understood that as the pinion *k,* toothed wheel *j,* and barrel or windlass *i, i,* are made to revolve, one end of the beam or lever *c, c,* will be raised, and the opposite end depressed, by one of the ropes passing over and the other under the barrel or windlass; and by this means one frame of hides will be lifted out of the tan liquor, while the

hides on the opposite one are totally immersed. This operation may be reversed by turning the winch in the opposite direction. The ascent and descent of the frames is assisted by the forked guides *m, m,* (see fig. 2,) which work against the vertical guide-rods *n, n.* At night, or at other times, when it is necessary that the hides on both frames should be immersed, this object is easily effected by unhooking from the suspending chains or ropes *d, d,* by means of the hook *r,* the frame that is already immersed, and then allowing the other frame to descend into the liquor, which it will easily do by its own weight. When one of the frames is raised, it is kept elevated by merely placing a leather or wooden block between the teeth of the toothed wheel *j,* and pinion *k,* and thereby preventing them from revolving. This stop fully answers the purpose, and is more convenient than a pall and ratchet-wheel.

Fig. 3, represents a side elevation of another plan of carrying out the counterbalance principle. In this plan the vibrating beam *c, c,* is suppressed, and the suspending cords or chains *d, d,* and the working cords or chains *h, h,* are united together, and form the cords or chains *o, o,* which pass over pulleys *p, p,* at the outer extremities of the standards *g, g,* and down between two other pulleys *q, q,* and round the barrel or windlass *i, i,* as in the former instance. If, however, it is thought more desirable, the pulleys *p, p,* and *q, q,* may be attached to a beam, or the ceiling above, instead of the standards *g, g.* The barrel *i,* is furnished with a toothed wheel *j,* and is driven by a pinion *k,* precisely in the manner explained in reference to figs. 1, and 2, and therefore no further explanation will be necessary.

The patentee has also shewn a means of raising the frames containing the hides or skins, one at a time. In this case the pulleys are fastened, as before-mentioned, to a beam above; the windlass or barrel being placed below.

Fig. 4, represents another plan of raising the frames. In this instance, several frames, with the hides or skins suspended vertically, may be raised at one time, but not upon the counterbalance principle. The frames, with the hides or skins, are raised by means of a rope or cord *s, s, s,* which passes over

pulleys *t, t, t*, affixed to a strong beam *u, u*, above. One end of the rope *s, s*, is firmly fixed to the beam, as seen in the drawing, and the other end is passed over the pulleys *t, t*, and round a windlass at the other extremity of the beam. The suspension cords of the frames are each furnished with a pulley or block *v*, constructed in such a manner that it may with facility be hooked on to, or detached from, the rope *s, s*, according to whether it be required to raise the frames containing the skins or hides, or parts of skins or hides, out of the tan-liquor, or to allow them to remain immersed. It will be found most convenient to raise only one half the number of frames at one time, leaving the remainder in the tan-liquor. In order to do this, the rope *s, s*, is brought down, and every other frame hooked on to the rope; then, by turning the windlass or barrel, and causing the rope *s, s*, to coil thereon, the frames, with the hides or skins, will be raised out of the pits, as shewn in the drawing; the other frames, which are not attached to the rope, remaining immersed. When the first lot of skins have been exposed a sufficient length of time to the atmosphere, the frames are lowered into the liquor again, where they are allowed to remain, by unhooking the pulleys *v, v*, which connect them to the rope *s, s*; and those which were before immersed, are now to be raised, by hooking them in their turn, by means of their pulleys *v, v*, on to the rope *s, s*. If thought advisable, the counterbalance principle may be applied to this arrangement or plan of raising and lowering the frames, by merely employing an additional rope *s, s*, passed over pulleys exactly similar to the one shewn in the drawing. One end of this rope, also, should be firmly attached to the end of the beam *u, u*, and the opposite end to the windlass or barrel; or, instead of two ropes, one only may be employed, by having it of sufficient length to pass from the end of the beam *u*, over the pulleys *t, t*, round the windlass and back again over similar pulleys *t, t*, to the end of the beam, so as to present a double rope, to one part of which the three frames 1, 3, 5, would be suspended, while the other frames 2, 4, would be suspended from the other part. Now, if a double rope *s*, is employed, there will be no necessity to detach the frames from the ropes. The

pulleys *v, v*, are merely made to run freely on the said ropes, and are not required to be constructed so as to hook on, as above-mentioned. It will now be understood, that if the counterbalance principle is carried out in this manner, one set of frames will be elevated, while the others are immersed; and the action of lowering one set will raise the other; that is, when the windlass is unwinding the rope to lower one set, it is at the same time winding up the other rope, and thereby raising those frames connected with it.

Fig. 5, represents another plan of raising the frames. In this plan a travelling windlass is employed, which may be made to traverse a railway or floor, constructed on the top of the beam *u, u*, above the frames. When it is required to raise a frame, with its skins or hides, the windlass is moved along the railway or floor immediately above the frame; and a rope, with a hook at the end, is let down to the frame, which is then attached thereto. The frame is then raised up by means of the windlass, until the skins are drawn out of the liquid, and are completely exposed to the atmosphere; in which position it is suspended by a hook *w*, firmly fastened to the beam *u*, where it remains until the manufacturer thinks it advisable to immerse the hides or skins again.

Having raised one frame up, and suspended it from the hook *w*, the attendant releases the rope belonging to the windlass, and proceeds along the floor or railway with the windlass to another frame, which he raises and suspends from its hook *w*, in the same way. When it is required to lower the frames, and their hides or skins, into the liquor, this must be done by means of the windlass, in exactly the same manner.

The patentee remarks, that although in the foregoing description the improved apparatus is described only as applied to the manufacture of leather, still it will be evident that the apparatus may also be employed for other purposes, in which it is required to raise the materials occasionally out of the liquor, so as to expose them to the atmosphere.

An apparatus of the description above shewn, may be used in dyeing various fabrics, with such modifications as this particular process will require, and which will readily suggest

themselves to the mind of any intelligent manufacturer or mechanic.

The patentee claims, First,—suspending hides and skins, and other substances, vertically, to moveable frames, which may be raised out of, or lowered into, the tan-liquor, in any convenient manner. Secondly,—the peculiar modes, above described, of raising and lowering the said frames; and more especially those plans in which one frame is made to balance another, and thereby reduce the labor of working the frames.—[*Inrolled in the Petty Bag Office, July,* 1845.]

Specification drawn by Messrs. Newton and Son.

To WILLOUGHBY METHLEY & THOMAS CHARLES METHLEY, *of Frith-street, Soho, in the county of Middlesex, ironmongers, for improvements in machinery for raising, lowering, and moving bodies or weights—being a communication.* —[Sealed 26th June, 1841.]

THESE improvements in machinery for raising, lowering, and moving bodies or weights are represented, in several views, in Plate IX.

Fig. 1, is a sectional elevation of a machine, arranged suitably for working as a capstan. *a, b,* are two grooved barrels, the lower grooves of which, where the cable or rope is first received, are of a semicircular form in their transverse section, but the succeeding grooves are gradually brought to an angular form, as they approach the top of the barrels. The barrels are mounted on axes or spindles *c, c,* which turn in bearings carried by the framing *d,* and bed-plate *e.* On the lower end of each barrel is a cog-wheel *f,* gearing into a pinion *g,* upon the spindle *h;* which spindle carries a capstan-head *i,* at its upper end, and is turned by means of bars, in the same manner as an ordinary capstan: thus, on the spindle *h,* being caused to rotate, motion will be given to the barrels *a, b,* by the pinion *g,* and wheels *f, f;* and the cable or rope *j,* will be wound on at the lower grooves; and, after passing around the barrels, in the manner represented, will be given off at the top grooves; by means of which arrangement, the rope will work without surging or fleeting. *k, k,* are pulleys,

for guiding away the slack of the rope; and *l*, is a ratchet-wheel, fixed on the lower end of one of the barrels, and acted upon by a pall *m*, to prevent the barrels from running back.

Fig. 2, is a plan view, and fig. 3, a vertical section of a windlass, constructed according to this invention. *a*, *b*, are two barrels, grooved in a similar manner to those shewn at fig. 1; and *c*, *c*, are the palls for preventing the barrels from running back. The chain-cable *d*, passes several times round the barrels, so that when the barrel *a*, is turned by means of handspikes, motion will be communicated to the barrel *b*: the cable will be found to lead freely to, and pass from, the barrels, without fleeting or surging; and it will be constantly drawn in, without the necessity of stopping, from time to time, to clear, as was before necessary.

The patentees state that, although they have only shewn the machinery arranged suitably for capstans and windlasses, the above modes of combining two barrels may be adopted in cranes and other machinery wherein cables or ropes are used for raising, lowering, or moving bodies or weights; and motion may be communicated thereto by winch handles, or other means.

They claim, as their invention, First,—the mode of combining the action of two grooved barrels *a*, and *b*, by means of the cog-wheels *f*, *f*, and pinion *g*, as above described; and, Secondly,—the mode of combining the action of two grooved barrels *a*, and *b*, as above described.—[*Inrolled in the Inrolment Office, December*, 1841.]

To James Nasmyth, *of Patricroft, in the county of Lancaster, civil engineer, for his invention of certain improvements in machinery or apparatus for hewing, dressing, splitting, breaking, stamping, crushing, and pressing stone, or other materials.*—[Sealed 2nd December, 1844.]

This invention consists, in the first place, in causing high pressure steam to exert its elastic force, in a direct manner, for alternately lifting up, and accelerating the fall of a piston, sliding in a vertical cylinder, to which piston certain chisels,

cutters, stampers, or hammers, are attached; for the purpose of hewing, dressing, splitting, breaking, stamping, crushing, and pressing stone, or other materials. And, secondly,—this invention consists in the peculiar manner by which the speed or number, as well as intensity of the blows, are modified, as may be desirable in the various stages of the before-named processes.

The drawing in Plate VIII., represents the improved apparatus in sectional elevation. It consists of a cylinder A, in which is fitted a piston B, and piston-rod C, working through a steam-tight stuffing-box D. The steam is conveyed to this cylinder from a suitable boiler, through a pipe E, so that by means of a slide-valve F, (in all respects similar to that generally employed in high pressure steam engines,) the steam is permitted to exert its elastic force upon the upper and under sides of the piston B, alternately, by the sliding up and down of the valve F, which receives its motion from a small piston sliding in a cylinder G, the piston-rod of which is at the same time the valve-rod for the valve F; the requisite amount of motion of this valve F, being regulated by a small crank and fly-wheel *g*, *g*, which, at the same time, gives the duly regulated motion to the valve of the small cylinder G, by means of an excentric at W.

The piston-rod C, is attached to a cylindrical block of iron K, sliding nearly air-tight within a cylinder H, placed immediately under the cylinder A. Steam being admitted by a pipe at I, to the small cylinder G, it immediately gives a rising and falling motion to the valve F, the rapidity of which motion is regulated by the rate of admission and pressure of the steam let into the small cylinder G. While the valve F, is being thus moved, steam is permitted to enter by the pipe E, and so obtain access alternately to the upper and under side of the piston B, which, together with its block K, is lifted up and forced down with a degree of force and rapidity as due to the pressure of the steam on the piston B, together with the weight of the mass K. But as there would be nothing to limit the motion of the piston B, in its upward and downward action, except its coming in contact with the top and bottom of the cylinder A, which, in its action, would soon knock out

and destroy that part of the apparatus, it becomes requisite to give a certain and definite motion to the piston B, and its block K. To attain this object the following means are adopted:—In the cylinder H, above and below the upper and under sides of the block K, are spaces nearly equal to the spaces above and below the upper and under sides of the piston B; the object of which is, that when the upper edge of the block K, in its upward motion, passes the hole L, the air remaining in the space M, M, is shut up and confined, and as it cannot escape so fast as it is compressed by the violent upward motion of the block K, it very soon acquires a degree of elasticity sufficient, not only to prevent all risk of the upper end of the block K, from striking the bottom of the cylinder A, and also that of the piston B, striking the top of the cylinder—but what is of more importance, the so confined and compressed air exerts a powerful elastic action, which gives vast energy to the downward action or blow, which is given out by the fall of the block K, aided by the pressure of the steam on the top of the piston B, together with that of the compressed air on the upper side of the block K.

The patentee having thus described the manner in which the upward action of the block K is limited, he proceeds to state how the downward action of the block K, is also limited. It will be seen that the cylinder H, has a bottom at N, furnished with a nearly air-tight hole *n*, through which the chisel or cutter-holder T, slides; and, as the under edge of the block K, in its downward action, confines and compresses the air in the space P, P, by passing the hole O, it shuts up the air in the space P, P, in the same manner as in the upward action; so that, according to the degree of intensity with which the block K, is required to transmit its momentum to any object placed under the chisel-holder T, all that has to be done is to regulate the degree of compression of the air in the under chamber P, P, which is accomplished in the most simple manner, by having means to regulate the size of the escape aperture at Z. By this simple means, a species of elastic or springing blow is obtained, which allows of a delicate touch or powerful blow being given to any object placed under the chisel-holder T; besides which, the elasticity of the

air-cushion in the chamber P, P, very importantly assists in recommencing the upward motion of the block K, without any jerk or destructive action whatsoever. The same means are also provided for regulating the elastic air-cushion in the upper chamber M, M. On the return stroke of the block K, the holes L, and O, permit the air to re-enter, with perfect freedom, at every stroke.

It will now be evident, that by means of this apparatus, all due power and control being obtained over the energy of motion of the block K, its action may be applied to give the requisite lifting and falling action to certain chisels, cutters, stampers, or hammers, such as may be attached or fixed to the end of the holder T, so that on placing an object, as a block of stone, or other material, under the chisels, and at a due distance, the surface of the stone will receive such a portion of the full force of the blow, arising from the fall of the block, as it may be desired to receive. In the case of hewing or chopping the surface of stones by such means, all that has to be done is to fix the stones on to a sliding-table, which has a progressive motion given to it in directions at right angles to each other; so that, by the combined or separate action of such sliding motion, all or any portion of its surface may be brought in succession under the action of the blows transmitted to it by the rapid rise and fall of the block K, and its attached chisels; and by the due regulation of the air-cushion under the block K, in the chamber P, P, powerful blows or delicate touches may be transmitted to its surface at pleasure, in any order or degree of variety, both as to force and rapidity; the air-cushion regulating the force, while the admission of the steam into the cylinders G, and A, regulates the rapidity.

The patentee claims, Firstly,—the direct application of the elastic force of steam to raise and depress the tool or tools by which stones may be chipped or dressed, whatever may be the character or construction of steam-engine by which such elastic force is brought to act directly in raising and depressing the working chisel, pick, or other tool, that operates upon the surface of the stone. Secondly,—the employment of compressed air, or air-cushions, to temper or regulate the action of the steam-piston, and the intensity of the blow given

by the tool in the act of striking the surface of the stone; also, the means described by which the elastic resistance of such volumes of compressed air are varied, in order to modify and determine the force of the striking-tool, according to the work under operation.—[*Inrolled in the Petty Bag Office, June,* 1845.]

Specification drawn by Messrs. Newton and Son.

To William Irving, *of Regent-street, Lambeth, in the county of Surrey, engineer, for improvements in the construction of apparatus for cutting ornamental forms, beads, recesses, and mouldings, in wood, stone, and other materials.*—[Sealed 10th February, 1845.]

These improvements in the construction of apparatus for cutting ornamental forms, beads, recesses, and mouldings, in wood, stone, and other materials, consist in certain novel combinations of known mechanical parts, by means of which a rotary cutter, mounted in a rising and falling frame, is made to operate for the purpose of cutting away or carving out portions of a slab or block of wood, stone, &c., placed upon a table below; the table, with the said slab or block, being made to traverse longitudinally and transversely, for the purpose of bringing every part of the block under the action of the said cutter.

In Plate VIII., this improved construction of apparatus is shewn in various positions, in complete working order. Fig. 1, is a longitudinal elevation of the machine; fig. 2, a transverse sectional elevation of the same; and fig. 3, a horizontal view, looking down upon the machine; the driving-pulleys and wheels, and some of the other parts above, being removed to avoid confusion. *a, a,* is the lower frame-work or standards, the upper horizontal edges of which may be of an angular or v form, for the purpose of steadying and guiding the longitudinal movements of the bed-frames *b, b, b, b.* Upon these bed-frames are mounted the transverse sliding-bars *c, c,* which carry the table *d, d,* whereon the block A, is to be fixed; and by means of these two sliding movements, the table, with the block, is moved both longitudinally and transversely,

in order to produce any variety of form or figures on the block.

The bed-frames *b, b,* are connected together by means of a longitudinal toothed rack, shewn by dots, (see fig. 1,) by which the bed is moved longitudinally, through the agency of a toothed pinion *e,* mounted on the middle of the shaft *f*; on the end of this shaft is another pinion *g,* which gears into, and is driven by a pinion on the pulley-shaft *h.* This shaft *h,* carries two pulleys *i,* and *j,* (see figs. 1, and 3,) which are driven by bands *i**, and *j**, coming from the pulleys *k, k,* above. The band of the pulley *i,* is straight, and the band of the pulley *j,* is crossed; consequently the two pulleys *i,* and *j,* revolve in opposite directions. A double-action clutch-box *l,* is mounted on the pulley-shaft *h,* immediately between the two pulleys *i,* and *j*; and, by bringing the said clutch into gear with either of the pulleys *i,* and *j,* by means of a corresponding clutch on the bosses of the said pulleys, the pulley-shaft may be made to revolve in either direction; or, by withdrawing the clutch *l,* and leaving it midway between the pulleys, and out of gear with both of them, the shaft *h,* and consequently the bed-frame *b, b,* and transverse bars *c, c,* carrying the table *d, d,* will remain stationary. The attendant has the clutch-box under perfect command, and is enabled to work the same by means of the long horizontal lever *m,* and rod *n.* It will now be evident, that as the pulleys *i,* and *j,* are constantly kept revolving, the longitudinal movement of the table, forwards and backwards, may be altered or arrested at pleasure, by merely altering the position of the clutch-box *l.* It may be desirable, for some purposes, to make this part of the machine self-acting; that is to say, when the bed-plate or table has proceeded onwards a certain distance, to make it return again to the original starting point, without the assistance of an attendant to alter the clutch. This is effected by means of an apparatus, somewhat similar to those in use in planing machines, to effect a similar operation. *o,* is a lever, mounted horizontally, and securely fastened on to a vertical shaft *p,* as seen best in figs. 3, and 4; the outer end of this shaft is connected to the clutch-box *l,* as shewn in the plan view. A second lever *q,* is also mounted on, and firmly secured

to the shaft *p*, at right angles to the lever *o*; its outer end extending over a flat horizontal bar *r*, connected to the bed-frame *b*, *b*, and consequently partaking of its movements. This bar *r*, *r*, has a number of holes made all along it, and is furnished with two pins or pegs, which may be inserted into the holes before-mentioned, according to the distance that the bed-plate, with its block, is required to travel. One pin or peg is inserted in a hole in the bar *r*, corresponding with one end of the distance, and the second peg in another hole, corresponding with the opposite end (the horizontal lever *q*, being situated between them); then, when the block is fixed on the bed-plate, in its position, and firmly secured, one or the other of the sides of the clutch *l*, is, by means of the hand-lever *m*, and rod *n*, brought into gear with one of the pulleys *i*, or *j*, and a longitudinal motion is thereby communicated to the bed-plate or table; and immediately that it has arrived at the end of its course, that is, when one of the pins of the bar *r*, strikes against the lever *q*, this latter is driven back, thereby causing the vertical shaft *p*, to turn on its centre, and also alter the position of the other lever *o*; whereby, the clutch-box *l*, will be moved along the pulley-shaft, out of gear with the pulley with which it was formerly in connection, and into gear with the other one; thereby instantaneously changing the course of the advancing or receding bed-plate, and causing it to proceed in the opposite direction. In order to make this self-acting apparatus act with greater precision, a weighted tumbling-lever *s*, is connected thereto, which, when acted upon, by a short lever or arm *t*, extending from the upper part of the vertical shaft *p*, is gradually raised out of its inclined position, as shewn in figs. 2, and 3; and, when it passes over the centre of gravity, it suddenly falls forward, thereby giving the vertical-shaft *p*, and consequently the clutch-lever *o*, connected therewith, a sharp jerk round, and throwing over the clutch *l*, more suddenly than if it were forced over by the slow onward progress of the horizontal-bar *r*, *r*.

The transverse motion of the bed-plate or table is effected by means of two screwed-shafts *u*, *u*, which are mounted in bearings in the bed-frame *b*, *b*, and pass through screw-boxes attached to the under sides of the bed-plate or table, as repre-

sented by dots in the plan view, fig. 3, or to the transverse bars *c, c,* which are also secured to the bed-plate, and slide in the bed-frames *b, b,*—see the front view, fig. 1.

The screwed-shafts *u, u,* are actuated by means of the winch-handle on the shaft *w,* which carries a bevil-pinion that gears into a corresponding bevil-pinion *x,* on the longitudinal shaft *y, y.* This shaft also carries two other bevil-pinions *z, z,* of the same diameter and number of teeth; which pinions gear into corresponding bevil-pinions, on the ends of the screwed-shafts *u, u*; and consequently when the winch-handle is turned, it actuates the longitudinal-shaft *y, y,* and the transverse screwed-shafts *u, u,* and thereby causes the bed-plate to move transversely.

Having described and explained the construction and movements of the bed-plate, the patentee observes, that the block must be secured thereon in such a manner, that, when once the operation of carving is commenced, the block will not alter its position. The means adopted for effecting this object is, by the employment of clamps 1, 1, which are made to slide in metal or other grooved pieces, 2, 2, made in the upper side of the bed-plate; and when brought up against the block they are tightly screwed up, so as to be perfectly immoveable. If the block is of stone, it may be secured in a similar manner, or other means may be employed if thought more convenient.

The drill is mounted vertically in bearings made in the moveable-frame 3, 3, which is capable of rising and falling in grooves made in the cast-iron standards 4, 4, as shewn best in fig. 1. This sliding-frame is suspended, by means of a chain, from a sector at one end of the long lever 5, 5, which has its fulcrum in the framing, and is connected at its opposite end to a rod 6, 6, the lower end of which is furnished with a chain or cord, by which it is connected to the barrel 7. This barrel 7, is mounted in bearings connected to the standards *a, a, a,* and part of the chain at the end of the rod 6, is wound thereon. Another chain 8, attached to one end of the rod 9, (see fig. 3,) is also connected with the barrel, and partially surrounds its periphery. The opposite end of the rod 9, is slotted or branched, and has a female screw or screw-box made thereon

for the purpose of receiving a screwed-shaft 10. At the outer end of this shaft, which is mounted in a bearing in the side framing, is a winch-handle, by turning which in one direction, the screw-shaft 10, draws back the rod 9, and pulls round the barrel 7, thereby coiling a portion of the chain at the lower end of the rod 6, thereon. By these means, the longer arm of the long lever 5, 5, is depressed, and the other end consequently raised, thereby lifting the frame 3, 3, which carries the cutter or drill. If the machine is to cut plain or straight mouldings, then, when the drill has been raised to its proper elevation, the frame 3, 3, may be firmly secured in that position, and prevented from rising or falling, by means of a bolt and nut 11. The manner of actuating the drill will be clearly seen in fig. 1. When properly adjusted to the desired height, and in rotary motion, the workman shifts the clutch into gear, which gives the table a longitudinal movement, and brings the slab or block in contact with the drill, for the purpose of cutting or carving, longitudinally, the desired form therein. If curves, or transverse, angular, or other figures, are required, the transverse movements of the table, on which the slab or block is fixed, are effected by the winch and gearing before described.

If the improved machinery is to be employed for cutting or carving figures or foliage, or subjects in bas-relief, the patentee attaches an indicator or tracing point, which will, at all times, act simultaneously and parallel with the traversing as well as the up and down movements of the rotary drill. A mode of adapting this indicator or tracing point is shewn in the partial view of the machine at figs. 4, and 5; the former of which is a longitudinal section of part of the machine, and the latter a horizontal view of the same.

It will be seen that the tracing point and drill are mounted in distinct pieces; but when in use, they are firmly connected together, either by screws and nuts, or otherwise, so as to prevent them from changing their relative positions. If, however, it should be thought desirable or more convenient, the parts which carry the tracing point and drill may be made in one piece, as is shewn by dotted lines in figs. 4, and 5. The bolt and nut 11, by which the sliding-frame is fastened to the

standards when cutting mouldings, must be loosened, and the framing 3, 3, allowed to rise and fall freely whenever the winch-handle of the screwed shaft 10, is turned in either direction. The drill or cutting instrument 12, which may be of any required shape, is, as before-mentioned, mounted in bearings made in the rising frame 3, and is furnished with a fast and loose pulley, driven by a band from a large horizontal drum 13, 13,—see figs. 1, and 3. The tracing point 14, (see figs. 4, and 5,) is mounted in a moveable piece or arm 15, which is firmly secured to the lower arm of the rising-frame, by means of a bolt at 16, (fig. 5,); and being furnished with a sector-slot at its inner end, as shewn in the plan view, this arm may be secured in any position, by screwing up a second screw-bolt in the sector-slot. When the proper altitude of the tracing point is ascertained, it is secured in its hole in the head of the arm 15, by means of a screw, as shewn in the figures. It will now be clearly understood, that as the onward longitudinal and transverse motions of the bed-plate brings the model under the tracing-point, and the block under the cutter, the attendant must, by means of the handle of the screwed shaft 10, make the tracing point accurately follow all the inequalities of the model; and as, in order to do this, the sliding-framing 3, 3, to which the tracing-point is connected, must be alternately raised and depressed, according to the nature of the design, it will be evident that the drill or cutting-instrument will be made to perform precisely the same evolutions, and will consequently cut away the block to the depth indicated by the tracing-point. If small and light work is to be executed, the gearing which actuates the bed-plate or table carrying the block to be operated upon, is dispensed with, and the table, with its block, may be shifted under the drill by hand. If circular or curved mouldings are required, the block to be operated upon must be secured upon a curved or semicircular table, which is to be connected to a vibrating arm, extending laterally beyond the machine; and, by mounting this arm horizontally on a centre, the table may be moved round, with the block thereon, in a curve or portion of a circle.

To produce curves of different radii, the centre of motion

of the projecting arm is made adjustable; that is to say, capable of being placed nearer to or further from the drill or cutting instrument, as may be required.

It has been before stated, that when blocks are operated upon, the table may be easily moved about under the drill by the workman, without the assistance of any mechanical contrivance; but when weighty blocks, of large dimensions, are employed, it will then be necessary to employ some mechanical means to assist the workman, and which will readily suggest themselves to any intelligent mechanic. One plan, proposed by the patentee, is to attach a cord or chain to one end of the curved or semicircular table, and after passing it round the curved part or edge of the said table, it is to be connected to a barrel or roller, and, by causing this latter to turn slowly on its axis, the cord or chain becomes wound thereon, and the table and block gradually drawn round in a circular direction.

The patentee claims,—"a combination of machinery, by which longitudinal and transverse movements can be given to a slab or block of wood, stone, or other material, to be cut or carved into ornamental raised forms, figures, mouldings, foliage, and other shapes, by the agency of a rotary drill; the drill being capable of rising and falling in vertical directions, so as to form bold inequalities on the face of the wood, stone, or other material operated upon."—[*Inrolled in the Petty Bag Office, August,* 1845.]

Specification drawn by Messrs. Newton and Son.

To Robert Barr Purbrick, *of Tonbridge, in the county of Kent, engineer, for certain improvements in certain apparatus used in the manufacture of sugar, which apparatus is commonly called sugar-pans or coppers.*—[Sealed 13th March, 1845.]

The first part of this invention consists in constructing sugar-pans or coppers of the shape represented at figs. 1, and 2, in Plate IX.; fig. 1, being a side view, and fig. 2, an end view of a sugar-pan. The bottom or lowest part *a*, is of a

semi-cylindrical form; to its upper edges are rivetted the curved portions *b, b*; and to these curved portions two flat vertical sides *c, c*, are likewise rivetted. The ends of the pan consist of four pieces *d, d*, and *e, e*; the lower parts *d, d*, are flat surfaces, inclining somewhat outwards; and the upper parts *e, e*, are also flat surfaces, considerably inclined outward. The middle part of the bottom *a*, is sunk, so as to form a receptacle a^1, from which the last remaining portion of syrup can be ladled out, in order to completely empty the pan. The form of the pan or copper, in its horizontal plan, is rectangular, as shewn at fig. 3.

Fig. 3, is a plan view, and fig. 4, a longitudinal section of a series of seven pans or coppers A, A, B, C, D, E, F, constructed as above, and put together, and set or hung in brick-work, according to the second part of this invention; fig. 5, is a transverse section, in the line 1, 2, of fig. 4; and fig. 6, is a transverse section, in the line 3, 4, of fig. 4. The two pans A, A, are made of a smaller size, for "teaches," and are set side by side at the end of the row of larger pans. The teaches A, A, are not placed over the fire-places *f, f*, but just behind the same, so that the flame from the fires passes over the fire-bridge *g*, and striking laterally against the bottoms of the teaches, descends in the curved course or passage left between the lower parts of the teaches and the brick-work *h*, beneath; which brickwork conforms to the cylindrical curvature of the lower parts of the pans, and, therefore, rises in the spaces between them, so as to form an undulating course or flue *i*, for the current of flame, heated air or gas, and smoke, to pass along, and act beneath the bottom of all the pans in the series. It will be seen that the upper part of the flue *i*, is not required to be made of brickwork, as must be the case when setting the ordinary circular pans in a row or series, but that the whole of the upper part is formed by the bottom of the pans. By this means a very extensive heating surface is obtained for boiling and evaporating the cane juice. The flat vertical sides *c, c*, of the pans are rivetted or otherwise fastened together; thus forming, as it were, one long boiling vessel, having an undulating or waved bottom, and parallel sides, and with partitions across its width at the

highest parts of the undulations of the bottom, so as to divide it into compartments. The upper part of the brickwork consists of two walls h^1, h^1, formed in the manner represented in the transverse sections, figs. 5, and 6, in order to support the pans, and leave a space between the lower parts *d*, *d*, of the ends and the sides of the walls, for the passage of the flame, heated air or gas, and smoke; *j*, *j*, are pieces of metal which project out horizontally from the ends of each pan, and are built into the walls. There is also a middle wall h^2, which separates the fire-places *f*, *f*, and supports the inner ends of the teaches A, A; but in the event of one large teach being used, instead of two small ones, then this wall will be unnecessary.

If preferred, the undulating course of the flue *i*, may be prolonged, in order to conduct the current of flame, heated air or gas, and smoke, beneath the boiler of a steam-engine for working a sugar-mill, before that current begins to ascend the vertical chimney-stack *k*. The flat vertical sides *c*, *c*, of the pans should be cut down with notches to a lower level than the ends *e*, *e*, to facilitate the transfer of the juice from one pan to another, and likewise the skimming of the juice. As the surface of the juice is liable at times to boil up, the inclined ends *e*, *e*, of the pans must be so much higher than the level at which the juice is kept in them as to avoid any risk of boiling over; but the vertical sides *c*, *c*, being in contact with one another, may be lower; because, in case of boiling over, it would only be from one pan into the next. The level to which the notches in the sides *c*, *c*, may be cut down is designated by the dotted line *l*, fig. 4, (that level being lowest at the grand pan or copper F, and highest at the teaches A, A); and if the pans are all kept filled with juice to a suitable level for each one, the scum which rises upon the surface can be easily removed, by skimming it over the notches from one pan into the next, from the teach towards the grand pan, and can be ladled out from the surface of the juice in the grand pan, or any other one of the series, as may be most convenient.

In conclusion, the patentee states, that his invention consists "in the form of the pans or coppers (as hereinbefore

described) being rectangular in their horizontal plan (instead of circular, as in the common sugar-pans or coppers heretofore commonly used), and their bottoms being portions of cylindrical surfaces, concave and convex combined, as hereinbefore described (instead of being portions of spherical concave surfaces, as in the said common sugar-pans or coppers), and with flat vertical surfaces at those parts which will be adjacent when a number of such pans or coppers are set in a row or series, suitably for joining one to another at such flat vertical surfaces, as hereinbefore described, without leaving any interval between the several pans or coppers. Also in combining a number of such pans or coppers together in a series, and setting them in brickwork, as hereinbefore described; whereby such series of pans or coppers, so combined, will become, as it were, one long vessel, with parallel sides, and an undulating bottom, and having partitions across its width, at the highest parts of the undulations of the bottom, so as to divide its interior capacity into compartments; and with the whole of the said undulating bottom covering over and forming the upper part of the flue or passage, from the fire-places to the chimney, as hereinbefore described."—[*Inrolled in the Rolls Chapel Office, September,* 1845.]

To PETER FAIRBAIRN, *of Leeds, in the county of York, engineer, for certain improvements in machinery for drawing, roving, and spinning hemp, flax, tow, silk, wool, and other fibrous substances.*—[Sealed 10th February, 1845.]

THESE improvements consist, firstly, in certain variations in the means of actuating the worm-shafts that conduct the heckle-bars of gills and similar machinery, by which the fibres of flax and other fibrous materials are opened and drawn, in the process of forming them into slivers or rovings; secondly, in an improved construction of the frame-work in which the upper drawing-rollers of drawing and roving-frames are mounted; and, thirdly, in a novel mode of connecting the driving-wheel to the machinery of the gills, for the purpose of preventing the gear from being broken by any extraordinary resistance.

In Plate VII., fig. 1, represents, in sectional elevation, some of the known working parts of an ordinary drawing-frame, taken on the inner side, near the driving end of the machine; the improved parts being added thereto, and shewn in their proper situation. Fig. 2, is a horizontal view of part of the same machine, as seen from above. The respective letters of reference indicate the same parts in both figures.

A, is the main longitudinal driving-shaft, commonly called the "back-shaft," on which the band-wheel or driving-pulley is fixed (but not seen in the drawing). This main shaft extends, longitudinally, along the back part of the machine, and turns in suitable bearings in the frame-work. Upon this shaft is fixed an inclined-tooth pinion or worm-wheel B.

The upper and lower ordinary worm-shafts C, and D, turn also in suitable bearings in the frame-work, for the purpose of conducting the heckle-bars or fallers in the way commonly practised in gill-machinery.

At the outer end of the lower of these worm-shafts D, an inclined-tooth pinion or worm-wheel E, is affixed, which gears into the before-described inclined-tooth pinion B, on the driving-shaft, and these constitute one of the features of the invention.

It will be seen, that as the driving-shaft A, and pinion B, revolve, the pinion E, with the lower worm-shaft D, will be driven also; and by the coupling-wheels *c*, and *d*, respectively affixed upon the worm-shafts C, and D, those shafts will be made to turn simultaneously, in opposite directions, for conducting the heckle-bars, as usual.

The advantages to be attained by the employment of the two inclined-tooth pinions or worm-wheels B, and E, for actuating the worm-shafts C, and D, are a more smooth and uniform movement of the heckle-bars than could be attained by the old mode of driving them through the medium of bevil gear; and an economical reduction of, or dispensing with, some parts of the old driving apparatus; which also affords greater facilities for cleaning, adjusting, and repairing the worm-shafts and heckle-bars, than existed in the previously-constructed gill-machinery.

The improved construction of the frame-work, which con-

stitutes the second head of the invention, consists in shifting the situation of the outer brackets F, in which the ends of the axle *f*, *f*, of the outer pairs of top drawing-rollers are supported, as seen in fig. 2. The situation of these brackets was formerly such, that it was always necessary to make the axle of the outer pairs of top drawing-rollers considerably longer than the axles of the other pairs of top drawing-rollers, which produced not only inconvenience to the workmen, but also unequal wear on the pivots of the axles, and hence variable pressure upon the sliver.

By thus bringing the outer brackets nearer the middle of the machine, the distance apart of all the brackets becomes the same, and any one of the pairs of rollers (their axles being all of the same length) will fit into the spaces between the outer as well as the inner bearings.

The third feature of improvement is in the mode of connecting the driving-wheel G, (see fig. 2,) to the shaft A. The former mode of attaching this driving-wheel G, to the shaft A, was by a key or other strong fastening; the inconvenience of which was, that in the event of any extraordinary resistance in the working of the internal machinery, arising from derangement in the movements of the gill-bars or fallers, some of the weaker parts of the machinery would break. To obviate this inconvenience, instead of affixing the driving-wheel G, to the main shaft A, by a key or other strong fastening, it is proposed to insert a slight pin into the side of the driving-wheel G, shewn by dots at *a*, in fig. 2; which pin (when the shaft and driving-wheel are put together, as seen in the figure), passes into a suitable hole in the shaft A, and connects the driving-wheel to the shaft with sufficient strength, for the purpose of actuating the wheels B, and E, and thereby driving the worm-shafts of the gills.

The patentee claims, Firstly,—the employment of oblique toothed pinions or worm-wheels for driving the screw-shafts which conduct the gill-bars or fallers, in place of the ordinary bevil gear heretofore used for that purpose. Secondly,—the variation in the construction or position of the brackets which support the outer pairs of top drawing-rollers, as shewn. And, Thirdly,—the mode of connecting the driving-wheel or pinion

G, to the shaft which actuates the worms and gills, by means of a slight pin, which is capable of breaking readily in the event of any extraordinary obstruction in the gills, or strain in the mechanical parts connected therewith.—[*Inrolled in the Petty Bag Office, August*, 1845.]

Specification drawn by Messrs. Newton and Son.

To William Henry Smith, *of Wellingborough, in the county of Northampton, boot manufacturer, for his invention of certain improvements in the construction of boots, shoes, and other coverings for the legs and feet; and also in the means of, or apparatus for, fastening the same upon the leg or foot.*—[Sealed 4th February, 1845.]

This invention consists, in the first place, in a novel mode of cutting the leather, to form the boot, from the skin of leather, so as to dispense with some of the seams that ordinarily exist, and thereby to economise the leather; and also in an improved plan of constructing hunting boots, to allow of the escape of perspiration from the leg or foot. Secondly,—in a novel and simple fastening, denominated the "Euknemida" fastening, whereby boots, shoes, gaiters, spatterdashes, and other coverings for the legs or feet, may be adapted or applied to, or taken from, the leg or foot, with facility, and yet may be securely held thereon when in use, without the aid of strings, straps, buttons, or buckles.

The first part of the invention is shewn in Plate IX., at figs. 1, 2, and 3.—Fig. 1, represents a piece of leather cut in a peculiar manner, so as to form a short boot out of one piece, and without having a seam behind, up the back of the heel, or at one side. Fig. 2, represents a boot complete, and made according to this plan. The dotted line at *a*, *a*, fig. 1, represents the line which will run up the back of the heel; *b*, *b*, is a part of one of the improved fastenings, hereafter described, sewn upon the leather. The dotted line at *c*, *c*, represents the line from the toe to the instep, and the place where the upper part of the leather is folded over, to form the inner side of the boot; *d*, *d*, is the part of the inner side of the boot to which that part of the improved fastening

shewn at *b, b,* corresponds. Fig. 3, represents the improved ventilating hunting boot, which is open all the way down to the ancle. The leg of the boot is closed by the fastening hereafter described, which is very flat, and sets very closely, but yet will be found amply sufficient to ventilate the foot and leg, and allow the perspiration and warmth to escape. The thigh part of the boot is closed by buttons, as shewn in the drawing.

The improved fastening, which forms the second part of the invention, consists of two thin pieces of steel, or other suitable elastic material, one of which is furnished with studs or projections, which are made to take into corresponding holes or recesses, and thereby form a collapsing fastening.

Several varieties of this kind of fastening are shewn in the drawings. Figs. 4, and 5, represent one construction; but the same principle exists in all the other figures, although the means of connecting the parts together are somewhat different. It will be seen, that in figs. 4, 5, 6, 7, 8, 9, 10, and 11, the two pieces of steel, or other suitable elastic material, of which the fastening is composed, are bent outwards, in opposite directions; and, therefore, when they are brought together to be fastened, as shewn in figs. 5, and 9, the two parts are bent back or collapsed, and will hold firmly together, and form a perfectly secure and very flat fastening, and will keep the article to which it is applied from working down in wrinkles. In figs. 4, and 5, the two pieces of steel are fastened together by inserting the points of the top piece *a,* into the boxes or sockets placed at the end of the other piece *b;* and the tendency of the ends of both these pieces to bend outwards, will, of course, keep them securely fastened, until one end of the piece *a,* is withdrawn from one of the boxes or sockets.

Figs. 6, 7, 8, and 9, represent another mode of connecting these pieces together. In these figures one end of the piece *a,* is inserted into a box or socket, made in, or attached to, the upper end of the other piece *b;* and the two pieces are further connected by means of two studs on the piece *a,* taking into corresponding slots made in the piece *b,* as will be clearly seen. Fig. 9, represents the appearance the fastening would assume when the two pieces are connected together

or collapsed. Figs. 10, and 11, represent a third mode:—in this plan, the piece *a*, has notches made at each end, into which, studs, situated at the end of the piece *b*, *b*, are inserted.

At figs. 12, 13, and 14, a modified plan is shewn, in which the same effect can be obtained without bending the pieces of steel *a*, and *b*, in opposite directions, as in the other instances. In these figures both pieces are curved in the same direction, but one to a greater degree than the other. One may even be quite straight, or nearly so. The ends of the piece *b*, *b*, are bent back, and inserted into slits or openings made in the corresponding piece; and these slits are covered over with a small piece of steel, as shewn at *c*, *c*, so as to form a kind of box or socket. Fig. 15, represents the two pieces connected, from which it will be seen, that they form a flat and very secure fastening.

Fig. 16, represents another modification. In this instance, the piece *a*, is furnished with a small stud, which is rivetted near each end, as seen in the figure; and the piece *b*, has corresponding slots made at each end thereof, into which the studs of the piece *a*, are inserted.

Fig. 17, is a representation of a gaiter or spatterdash, with the improved fastening applied thereto. The piece *b*, which carries the box or stud, is attached to that part of the gaiter which is innermost, the other part *a*, being attached to the lapping or folding-over part. Both the pieces or blades *a*, and *b*, are sewn into the seam or edge of the gaiter, and nothing is visible but the points of the piece *a*, *a*, and the boxes or sockets of the piece *b*.

Fig. 18, represents an improved mode of closing a gaiter without buttons; in place of which, a thin plate of steel, furnished with any convenient number of studs, corresponding to holes made in the opposite side of the gaiter, is employed. It is stated, that by the employment of these improved fastenings, the gaiters may be put on and off with greater facility than ordinary ones, and kept better in shape.

The patentee claims, First,—the peculiar manner of cutting out a boot or shoe from a piece of leather, as shewn and described in reference to figs. 1, and 2. Secondly,—the mode

described, of constructing a ventilated hunting boot. And, Thirdly,—the various modes herein shewn and described, or any modification thereof, for the purpose of constructing a fastening, by means of blades or pieces of steel, or other suitable elastic material, which, when uncollapsed, are curved out of a straight line; but when brought into connection are bent back or collapsed; thereby causing them to securely retain their places, until disconnected by hand. And also the application of the said fastening to the various articles and purposes requiring the same.—[*Inrolled in the Petty Bag Office, August*, 1845.]

Specification drawn by Messrs. Newton and Son.

To William Stevens Villiers Sankey, *of Hampstead, in the county of Middlesex*, A.M., *for certain improvements in fastening and securing letters, packets, and despatches.*—[Sealed 20th February, 1845.]

This invention consists in fastening and securing letters, packets, and despatches, by metal clasps, which, when once closed, cannot be opened again or removed, except by such violence as would leave obvious signs of its use, and therefore ensure the detection of any fraudulent or unauthorized opening of the documents or articles so fastened.

In Plate IX., fig. 1, exhibits an envelope, secured by a metal clasp, and fig. 2, represents the same envelope open. The clasp consists of two pieces, A, and B. The piece A, is a disc, having a hasp *a*, affixed thereto (see also the enlarged views, figs. 3,); it is usually attached to the flap of the envelope, by a solution of shellac or other adhesive substance, with its hasp projecting through the paper. The piece B, (shewn separately, in transverse section, at fig. 4, and in plan view, with its top or upper disc removed, at fig. 5,) consists of a disc *b*, with a raised edge, on the top of which another disc *c*, is fixed, so as to form a small circular box; to the under side of the disc *c*, a catch or pointed strip of metal *d*, is attached, and its pointed end lies beneath a slit or opening *e*, which is made of a suitable size to admit of the hasp *a*,

passing through it; the piece or box B, thus constructed, is cemented to the inside of the back part of the envelope, as indicated by the dotted circle in fig. 2.

When it is desired to secure the envelope, the hasp *a*, is introduced into the opening *e*, and the end of the catch *d*, yielding, allows the lower part of the hasp to pass, but slips into the opening thereof, and holds the two parts A, and B, securely together. The envelope can now only be opened (fairly) by cutting or tearing the paper around the flap.

The catch *d*, instead of being a straight piece of metal, may be of a coiled or curved form, so as to act with the force of a spring; or it may consist of a small piece of metal, attached to the end of a coiled spring, as in the ordinary box-clasps. If found desirable, the positions of the pieces A, and B, may be reversed, as represented at fig. 6; and instead of the piece A, being fastened to the paper by some adhesive substance, it may be made with two prongs (as at *f*, *f*, fig. 7,), and secured to the paper by passing them through it, and then "burring" up the ends by a sharp blow of a mallet, or by pressure; the piece B, may be also attached to the paper in the same way. It is only when envelopes are manufactured for sale, with clasps fitted to them, that attachment of any sort is necessary, for the clasps may be sold by themselves (in two parts), and kept ready for use; in which case, the two parts being united on the instant by the hasp and catch, as before explained, no separate attachment of either to the paper, by means of an adhesive substance or otherwise, would be necessary The clasps may be applied, not only to envelopes containing letters and despatches, but directly to the letters and despatches themselves. That part of the clasp which is affixed to the flap of the envelope or letter may have any armorial or other distinguishing device engraven or stamped thereon.

The patentee claims, as his invention, the fastening and securing of letters, packets, and despatches, by means of a metallic clasp, constructed, attached, and acting as above described.—[*Inrolled in the Inrolment Office, August* 1845.]

To Augustus William Gadesden, *of Woburn-square, in the county of Middlesex, Gent., for improvements in the manufacture of sugar.*—[Sealed 16th January, 1845.]

The object of this invention is to effect the evaporation of syrups, at a low temperature; and this the patentee proposes to accomplish by causing cylinders to revolve in the syrups while they are being evaporated; which cylinders do not communicate any heat to the syrups, but, being partially immersed therein, by simply revolving they carry up the syrup out of the general body of the liquid contained in the evaporating vessels, and thus facilitate the evaporation.

In Plate IX., fig. 1, is an elevation, and fig. 2, a transverse section of a cylinder, contained in an evaporating vessel of the form preferred by the patentee, although he does not confine himself thereto. The cylinder *a*, is mounted on a shaft *b*, which turns in bearings *c*, *c*, attached to the ends of the evaporating vessel *d*, and receives motion from a steam-engine or other first mover, by means of an endless band *e*, passing around the pulley *f*. The cylinder *a*, is partly immersed in the syrup, as shewn in fig. 2, and, by revolving therein, will take up on its surface a thin film of heated syrup, which will have the effect of expediting the evaporation of the aqueous parts. The cylinder is composed of a series of bars, fixed upon suitable frames, in the manner represented; and in order that the cylinder may be as light as possible, the bars should be tubular, with closed ends. The surface of the cylinder, thus formed, is undulating, which is found beneficial; but a plain surface may be used. And although a cylindrical surface is best, yet (as the object to be obtained is an extended revolving surface in the syrup) a conical or other shape may be given to the surface.

In cases where it is desired to remove the steam from the apartment which contains the evaporating vessels, a cover may be placed over the top of each vessel and cylinder, with a pipe leading from it to a chimney or other outlet; care being taken to maintain such a draft as will cause the heated vapours to be quickly removed from the evaporating vessels.—[*Inrolled in the Inrolment Office, July,* 1845.]

To Robert Oxland, *of Plymouth, in the county of Devon, chemist, for improvements in the manufacture of chlorine.* —[Sealed 20th February, 1845.]

This invention consists in a method of manufacturing chlorine by the decomposition of hydrochloric acid by atmospheric air. The hydrochloric acid gas and atmospheric air are mixed in the proportion of one measure of the former to two of the latter; and the mixture is passed through an air-tight furnace, kept at a bright red heat. The hydrochloric acid is preferred to be obtained by decomposing common salt by sulphuric acid, in a furnace or retort, so heated that the products of combustion do not mix with the acid gas evolved; and the acid gas should be dried (previous to mixing it with the air), by passing it through a vessel filled with pieces of fire-brick, over which a small stream of sulphuric acid is constantly flowing. The requisite supply of atmospheric air is kept up, by pumping it into an iron reservoir, furnished with a stopcock or valve, for regulating the discharge of the air. The decomposing furnace, through which the mixture of hydrochloric acid and air is passed, resembles an ordinary reverberatory furnace in form; but it is so constructed as to admit of the fire passing over the arch and under the bed; by which means the furnace is heated without the fire passing into it. The furnace is filled with pieces of porous pumice-stone; and the gas and air enter at the end farthest from the fire, and pass out at the other end, through a pipe at the upper part of the furnace. That part of the furnace nearest the fire should be kept at a bright red heat, by a fire acting externally; the smoke passing through flues, over the furnace, into the chimney.

The products resulting from the admission of hydrochloric acid and atmospheric air into the decomposing furnace consist of chlorine, associated with undecomposed muriatic acid, and any excess of atmospheric air and nitrogen. This mixture is cooled, by passing it through a series of earthenware tubes, surrounded by water; after which, the hydrochloric acid is effectually separated, by passing the mixture through water; and, finally, the chlorine is obtained, and chloride of lime produced, by passing the residuary mixture into the

ordinary lime condenser, where the chlorine is absorbed, and the nitrogen and atmospheric air remaining are allowed to pass into the atmosphere.

The patentee does not confine himself to the above details, so long as the peculiar character of his invention be retained; but he claims the mode of manufacturing chlorine, by decomposing hydrochloric acid by atmospheric air.—[*Inrolled in the Inrolment Office, August*, 1845.]

To THOMAS DREW, *of St. Austell, Cornwall, chemist, and* EDWARD STOCKER, *of the same place, merchant, for certain improvements in the production and manufacture of naphtha, pyroligneous acid, or other inflammable matter.* —[Sealed 18th March, 1845.]

THE improvements in the manufacture of pyroligneous acid, naphtha, or other inflammable matter, protected by this patent, consist in obtaining these matters by the destructive distillation of peat, peat moss, or bog earth (which has been previously dried, or deprived of the greater portion of its moisture), in retorts made of iron, stone, fire-brick, or clay. Each retort is connected, by a short pipe, with a series of pipes, which form the apparatus employed for condensing the volatile products driven off from the retorts. The heat applied to the retorts may vary from a scarcely visible dull red to a bright red.

With regard to the condensing or refrigeratory apparatus, the patentees prefer, where locality will allow, not to pass the volatile products from all the retorts into one pipe, but to conduct them separately through one line of pipes, having, at certain intervals (commencing at about ten feet from the retort), descending pipes, through which the condensed products may pass into a receiver beneath. Each line of pipes should be placed in "shutes," about two inches wider and two inches deeper than the diameter of the pipe at the joint; the pipes should have a fall of about one inch in five feet, in the direction from the retort towards the end of the condenser; the shutes should have an inclination to the same extent in the opposite direction; by this arrangement, on

cold water being caused to run through the shutes, it will meet with the coolest part of the pipes first, and will therefore be most advantageously employed for absorbing the heat.

The products of this distillation will consist of water, naphtha or pyroxylic spirit, acetic or pyroligneous acid, ammonia, tar, oil, charcoal, and an incondensable inflammable gas; these matters may be separated from each other as in the treatment of the like products of the destructive distillation of wood.

The patentees do not claim, as their invention, the distillation of peat generally; but they claim the manufacture of naphtha or pyroxylic spirit, acetic or pyroligneous acid, ammonia, and the other inflammable matters, by distilling peat, peat moss, or bog earth, in retorts or vessels made of stone, or iron, or of fire-brick, or clay.—[*Inrolled in the Inrolment Office, September,* 1845.]

To HENRY JONES, *of Broadmead, Bristol, baker, for a new preparation of flour for certain purposes.*—[Sealed 13th March, 1845.]

THIS invention consists in mixing with the flour such acids and carbonated alkalies, or carbonated alkaline earths, and sugar, and salt (all in a dry and finely powdered state), as will, when the flour is made into bread, biscuits, and similar baked food, flavour the same, and cause the dough to rise without the employment of any fermenting matter.

The flour is made from wheat or other grain, of fine quality, and in a perfectly dry state; after grinding and dressing, it is left to ripen for a month or six weeks; then 10½ oz. avoirdupois, of tartaric acid, as dry as possible, and in fine powder, are added to each cwt. of flour. The mixture of flour and tartaric acid is passed through a flour dressing-machine, and allowed to remain untouched for two or three days, that the water of crystallization, always more or less present in the tartaric acid, may be absorbed by the flour, and so form around the particles of acid a coating of flour; which coating will prevent the particles of alkali from coming into immediate contact with the acid, and thus preserve its power of

action from being reduced. After this dressing process, an addition is made to the flour and acid of 12 oz. of bicarbonate of soda, 24 oz. of muriate of soda or common salt, and 8 oz. of loaf sugar, all in a finely powdered and dry state; and when the mixture has been passed through a flour dressing-machine, it will be ready for use.

The quantities of the acid and alkali used may have to be slightly varied, according to their quality; but the point to be attained is a neutralization of both. Other articles, such as bicarbonate of potash and citric acid, are stated to make excellent bread, but in general they are too expensive.

When the flour, prepared as above, is employed in the manufacture of bread, biscuits, or similar food, it only requires to be made into dough with water, in the proportion of 10 oz. of water to 1 lb. of flour for bread, and 6 oz. of water to 1 lb. of flour for biscuits, and baked at once in a well-heated oven.

The patentee claims the preparation of flour in the manner aforesaid, so that it will keep for a long time, and will be always ready to be made into bread, biscuits, or similar food, without the addition of any fermenting matter.—[*Inrolled in the Inrolment Office, September,* 1845.]

To WILLIAM OXLEY ENGLISH, *of Kingston-upon-Hull, distiller, for improvements in the distilling of turpentine and tar, and rectifying volatile spirits and oils.*—[Sealed 25th November, 1844.]

THIS invention consists, firstly, in distilling turpentine and tar at a low temperature; and, secondly, in rectifying the spirits of turpentine and tar, and other volatile spirits and essential oils, at a low temperature.

The following is the process employed by the patentee in carrying out his improvements:—The turpentine or tar which is to be distilled is placed in an ordinary retort, having a worm and receiver attached thereto; and the air is exhausted from the retort by an air-pump, applied either to the retort, the worm, or the receiver, as may be most convenient. By thus working in vacuum, it will be found, that the spirit flows over at a lower temperature

than when distilling after the usual method. A similar application of the air-pump to exhaust the air from the apparatus employed in the rectification of spirits and oils is stated to be equally advantageous, and forms the second head of the invention, as above mentioned.

The patentee claims, Firstly,—distilling turpentine and tar when the atmospheric pressure is withdrawn from the apparatus in which the distillation takes place. And, Secondly, —rectifying volatile spirits and oils in apparatus with the atmospheric pressure withdrawn therefrom.—[*Inrolled in the Inrolment Office, May,* 1845.]

To Thomas Forster, *of Streatham, Surrey, manufacturer, for improvements in preparing compositions of India-rubber and other articles for forming articles therefrom, and for the coating of surfaces of leather, and woven and other fabrics.*—[Sealed 6th March, 1844.]

The object of this invention is to combine India-rubber and shellac, or other gum or resinous bitumen, insoluble in water, with arseniate of potash or other mineral preservative of vegetable matter, by the employment of a proper solution, and a mechanical mixing process. This composition is intended to be used for casting or moulding articles, and for making sheets or other articles; and likewise for water-proofing leather and fabrics, by applying a coating of such composition to their surfaces. When it is desired to make articles by casting into moulds, such as balls, the legs, arms, heads, or other parts of dolls or figures, the proportion of shellac or resinous gums, compared with the India-rubber, must be greater than when the composition is for spreading over the surface of fabrics or leather. The proportions of the ingredients, and the mode of mixing for this purpose, are as follows:— To 20 lbs. of India-rubber, cut into slices of about half an inch thick, of good quality, and in a clean state, 10 lbs. of shellac, 2 lbs. of gum copal, 1 lb. of asphaltum, and ½ lb. of arseniate of potash, crushed fine, are added. The gum copal is melted in an iron pot, and while in a fluid state, the asphaltum and shellac (which have been previously mixed together)

are thrown in, and then the arseniate of potash is added. The mixture is now stirred with an iron rod, and, when properly mixed, is poured on to a flat surface to produce a thin sheet. The India-rubber is put into a suitable masticating machine to be ground, and the mixture above mentioned is gradually added, while the machine is externally heated with steam to about 150° Fahr. This composition, whilst hot, is run into moulds, the parts of which are held together by screws or other pressure, until the composition has had time to cool: the projecting edges, caused by the junction of the parts of the moulds, are then dressed off, and the cast is complete. If it is thought desirable to retain the elasticity of the India-rubber, a smaller proportion of the other ingredients must be used. The object of employing arseniate of potash is to preserve the India-rubber; but other mineral preservatives of vegetable matter may be used in place thereof; and likewise other gums, insoluble in water, may be employed instead of shellac. When thin sheets or threads of the above-described composition are required, the proportion of the ingredients may be altered according to the elasticity desired to be given. The India-rubber and other matters are ground together and placed in moulds, where the composition is submitted to pressure until cold; it may then be cut into the forms required.

To render leather or fabrics water-proof, or to give a smooth finish thereto, the patentee prefers the following proportions:—1 lb. of dark colored shellac, 1 lb. of gum copal, 2 lbs. of asphaltum, 1 lb. of artificial asphaltum (from coal tar), and ½ lb. of arseniate of potash; these are to be mixed in the manner above mentioned. 4 lbs. of this mixture are ground with every 20 lbs. of India-rubber, in a suitable masticating machine; the composition is then brought to the ordinary consistency of India-rubber cement, by any suitable solvent. It is then employed for coating the surface or surfaces of leather and fabrics, in the ordinary way of producing water-proof articles.

The patentee states, that on submitting a surface of the improved composition to the light of the sun for a few hours, the surface becomes smooth, and loses its sticky character, and it will not afterwards be injured by the heat of the sun,

or exposure to the air; it will also be found to resist India-rubber cement, and likewise the semi-fluid composition itself: hence, the composition, when spread on canvas, calico, or other fabric, becomes highly useful, resembling leather on the surface, and is thoroughly water-proof. When long sheets of the composition are to be made, a long piece of calico or other fabric is first prepared with a coating of the composition, which is submitted to the sun's rays for six or eight hours; after which time the surface will not allow any of the composition afterwards applied thereto to adhere. Then, by means of a guage or rollers, a coating, more or less thick, of the composition is laid on the surface of the cloth, and when submitted to the sun's heat, it is stripped off, and may be cut up for any purpose required. If it is thought desirable to give more than one coating of the composition to any cloth, it is rolled up and kept in the dark until the other coatings are added.

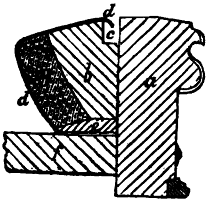
The machine for masticating the India-rubber which the patentee prefers to employ, consists of two rollers furnished with longitudinal angular grooves working into each other; these rollers are mounted in a pan surrounded with a steam-tight jacket, by means of which the India-rubber is heated. During the process of mastication a little potash (one ounce to a quart of water) is put into the mill to prevent the composition adhering to the rollers. The patentee states that he is aware shellac has been mixed with India-rubber, and used for various purposes; he lays no claim, therefore, to such mixture, but that which he claims is, Firstly,—applying or spreading a composition of India-rubber or other resinous gum or bitumen, not soluble in water, together with a solvent, and with or without arseniate of potash or other mineral preserver of vegetable matter, on one or more surfaces of leather and woven or other fabrics, to render the same waterproof; and for obtaining a smooth or even surface, as above described. Secondly,—combining such a quantity of shellac or other gum with or without arseniate of potash with India-rubber, so as to produce a composition, which may be moulded into various forms, and retain the desired figure, as herein described. Thirdly,—making sheets of the composition, herein described,

by spreading the same on a previously prepared surface. And, Fourthly,—grinding and mixing the materials, herein described, in a machine, composed of two angular rollers, placed in a heated vessel, as before explained.—[*Inrolled in the Inrolment Office, September,* 1844.]

To JOHN THURSTON, *of Catherine-street, Strand, in the county of Middlesex, for improvements in parts of billiard tables.*—[Sealed 26th March, 1845.]

THIS invention relates to those parts of billiard tables called the cushions.

It is important that the cushions should be so formed as to offer uniform elasticity in all parts, and that the same should not be liable to be changed by variation of temperature. Of late years, India-rubber has been applied as a means of obtaining the desired elasticity; but India-rubber is liable to become hard, if subjected to low temperatures, and is likewise affected by changes of temperature. To obviate these inconveniences, the patentee proposes to use a preparation of India-rubber, termed "Vulcanised India-rubber or caoutchouc," and described in the specification of a patent obtained by Thomas Hancock, 21st November, 1843*: the India-rubber is combined with sulphur, and subjected to high degrees of heat; whereby its elasticity becomes more permanent, and it is not affected to any injurious extent by changes of temperature.



The diagram represents a transverse section of one of the cushions of a billiard table to illustrate the application of this invention. *a*, is the wood part of the cushion, to which is screwed the deal blocking *b*, having in its upper part a groove *c*, to receive a slip of deal, that secures the upper edge of the cotton tick or swan-skin covering *d*, in the way heretofore practised. The lower edge of the

* See Vol. XXVI., of our present Series, p. 178.

covering *d*, is nailed to the under side of the capping *e*, before the cushion is fixed to the bed *f*, of the table; and the workman should be careful in applying this covering, so as not to strain it unequally over the elastic cushion or surface produced by the prepared India-rubber *g*. Over the tick or swan-skin covering *d*, the usual covering of superfine woollen cloth is applied.

The patentee claims "the adaptation and application of the prepared India-rubber, herein mentioned, to the constructing of the cushions of billiard tables."—[*Inrolled in the Inrolment Office, September*, 1845.]

REPORTS OF AMERICAN PATENTS.

From the "Journal of the Franklin Institute,'

EDITED BY DR. THOMAS P. JONES.

To ROBERT M. WADE, *Summit Point, Clark county, Virginia, for an improvement in the mill bush.*

THE mill bush is enlarged to receive rings of leather packing, which surround the spindle, and rest on the bottom of the hollow bush; these are held down by a metallic piston forced down upon the packing by a screw cap; the oil chamber, for containing oil, &c., to supply the packing and spindle, is formed by a groove in the upper face of the piston, and a corresponding one in the under face of the cap screw; the former being provided with holes for the discharge of oil at the junction of the packing and spindle, and the latter with holes for pouring in the supply of oil.

Claim:—"What I claim as my invention, and desire to secure by letters patent, is constructing the mill bush with an annular chamber, for containing the oil, or other lubricating substance, used for oiling the mill spindle, by making corresponding circular grooves in the bottom of the screw cap, and in the top of the piston, which thus answer the two-fold purpose of oil chamber and driver, for keeping the annular rings of leather packing, contained in the cylindrical cup, lubricated, and against the spindle, in the manner and for the purpose set forth."

To STUART PERRY, *New Port, Herkimer county, New York, for improvements in the engine, to be actuated by inflammable gas, or vapor.*

"IN my inflammable gas, or vapor engine," says the patentee, "the power which is to be obtained from it for the driving of ma-

chinery, is to be produced by the expansion consequent upon the combustion of vapor of spirits of turpentine, or of other evaporable inflammable liquids, or of gas, or vapor, or gas and vapor combined, obtained from undistilled turpentine, or from rosin, or such other substance as will produce inflammable vapor, carburetted hydrogen, or other inflammable gas, by the aid of atmospheric air, within a cylinder similar to that used in the steam-engine. It is well known to engineers, that various attempts have been made to generate power by the combustion of explosive compounds within a cylinder; the expansive force of such compounds, when ignited, being in some cases allowed to act directly upon a piston, whilst, in other cases, the compounds have been exploded for the purpose of obtaining a vacuum, into which the piston might be forced, by pressure induced on the other side of it; but such attempts have not resulted in the production of a machine which could be practically used with advantage."

Claim:—"What I claim, is the manner in which I have combined and arranged the air-pump, the reservoir, the retort, the air regulator, and the cocks which govern the admission of atmospheric air into the valve box, and their appendages, as described; by which arrangement I am enabled to supply the inflammable gas, or vapor, in regulated proportions, and to produce a pressure within the cylinder slightly exceeding that of the atmosphere, at the moment of opening one of the ignition orifices, which outward pressure is to be immediately succeeded by a draught inwards, this being effected in the manner and for the purpose described. I claim also the manner set forth, of heating the retort, by employing the heated air which escapes through the eduction tubes, so as to render such air effective in converting the combustible fluid employed into vapor."

To JONATHAN P. BARTLEY, *Flanders, Morris county, New Jersey, for an improvement in the machine for cutting shingles.*

TWO or more knives for cutting the shingles are affixed to the periphery of a hollow drum, with a flanch at each end; the shingles, after being separated from the bolt by the knives, pass through slots in the drum, which constitute the throats of the cutters, and are conducted out of the drum, and clear of the arms by curved guides.

Claim:—"What I claim as my invention, and which I desire to secure by letters patent, is the employment of the drum, in combination with the knives, for cutting shingles, and the curved guides for carrying off the shingles; the whole being constructed and arranged substantially as set forth."

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 143, Vol. XXVII.)

June 11th, 1844.

The PRESIDENT in the Chair.

"On the means of rendering large supplies of Water available in cases of Fire, and on the application of manual power to the working of Fire Engines." By James Braidwood, Assoc. Inst. C.E.

THE plans at present in use, are so few and simple, that it is conceived merely necessary to state the quantity of water required, and to describe the most approved modes of supplying it, in cases of ordinary fires.

If water can be obtained at an elevation, pipes with plugs or fire-cocks on them, are preferable to any other mode at present in use. The size of the pipes will depend on the distance and elevation of the head, and also on the size of the buildings to be protected. It may be assumed as a general rule, that the intensity of a fire depends, in a great measure, on the cubic contents of the buildings; distinction being made as to the nature and contents of such buildings. If no natural elevation of water can be made available, and the premises are of much value, it may be found advisable to erect elevated tanks; where this is done, the quantity of water to be kept ready, and the rate at which it is delivered, must depend on the means possessed of making use of the water.

The average size of fire engines may be taken at two cylinders of 7 inches diameter, with a length of stroke of 8 inches, making 40 strokes each per minute. This sized engine will throw 141 tons of water in six hours, and allowing one-fourth for waste, 176 tons would be a fair provision in the tanks for six hours' work; this quantity multiplied by the number of engines within reach, will give an idea of what is likely to be required at a large fire. If however there are steam engines, to keep up the supply through the mains, the quantity of water kept in readiness, may be reduced to two hours' consumption, as it is likely that the steam engines would be at work before that quantity was exhausted. This is what may be supposed to be required, in case of serious fires in dock-yards, in large stacks of warehouses, or in large manufactories.

Where water can be had at nearly the level of the premises, such as from rivers, canals, &c., if it is not thought prudent to erect elevated tanks, the water may be conducted under the surface by large cast-iron pipes, with openings at such distances as may seem advisable for introducing the suction pipes. This plan should not be adopted, where the level of the water is more

than 12 feet below the surface of the ground, as although a fire engine will, if perfectly tight, draw from a much greater depth than 14 feet (2 feet being allowed for the height of the engine), still a very trifling leakage will render it useless for the time, at such a depth.

The worst mode of supplying engines with water, is by covered sunk tanks; they are generally too small, and unless very numerous, confine the engines to one or two particular spots; obliging the firemen to increase the length of the hose, which materially diminishes the effect of the fire engine. If the tank is supplied by mains, from a reservoir, it would be much better to save the expense of the tank, and to place plugs or fire-cocks on the water-pipe. Another evil in sunk tanks, is, that the firemen can seldom guess what quantity of water they may depend upon, and they may thus be induced to attempt to stop a fire, at a point they would not have thought of, if they had known correctly the quantity of water in store.

Where sunk tanks are already constructed, they may be rendered more available by a partial use of the method shown in Fig. 1.

A great deal has lately been said as to extinguishing fires by jets from water mains, without the use of fire-engines. This, no doubt, may be done under particular circumstances, where the pressure is considerable, the pipes large, and if only one or two jets are required; but at large fires, where ten or twelve jets are necessary, the expense would be too considerable, especially as where the largest fires may be expected, water is generally least wanted for other purposes; besides, it appears wrong in principle to employ a power which decreases exactly in proportion to the extent to which it is used, independent of the great loss by friction in the leather hose, which reduces the delivery, and of course the height or force of the jet, $2\frac{1}{2}$ per cent. for every 40 lineal feet of leather hose through which the water passes, as was fully shown by the following experiments.

Memoranda of experiments tried on the mains and service-pipes of the Southwark Water Company, between 4 *and* 9 A. M. *of the* 31*st January,* 1844. *The wind blowing fresh from N.N.W.*

The pressure at the water-works at Battersea was kept at 120 feet during the experiments, and every service-pipe or other outlet was kept shut.

1*st Experiment.*—Six standcocks, with one length of $2\frac{1}{2}$ inches riveted leather hose, 40 feet long, and one copper branch 4 feet to 5 feet long, with a jet $\frac{7}{8}$ inch in diameter on each, were placed in six plugs on a main 7 inches diameter, in Union Street, between High Street, Borough, and Gravel Lane, Southwark, at distances of about 120 yards a part. The water was brought from the head at Battersea, by 4250 yards of iron pipes, 20 inches

diameter, 550 yards of 15 inches diameter, and 500 yards of 9 inches diameter.

1st. One standcock was opened, which gave a jet of 50 feet in height, and delivered 100 gallons per minute.

With four lengths of hose the jet was 40 feet high, and the delivery 92 gallons per minute. When the branch and jet were taken off, with one length of hose, the delivery was 260 gallons per minute.

2nd. The second standcock was then opened, and the jet from the first was 45 feet high.

3rd. The third standcock was opened, and the jet from the first was 40 feet high.

4th. The fourth standcock being opened, the first gave a jet of 35 feet high.

5th. The fifth being opened, the first gave a jet of 30 feet high.

6th. All the six being opened, the first gave a jet of 27 feet in height.

2nd Experiment.—Six standcocks were then put into plugs, on a main 9 inches diameter, in Tooley Street, the extreme distance being 450 yards, with hose and jets as in the first experiment. The water was brought from the head at Battersea, by 4250 yards of iron pipes of 20 inches diameter, 1000 yards of 15 inches diameter, and 1400 yards of 9 inches diameter. The weather was nearly the same, but the place of experiment was more protected from the wind than in Union Street.

1st. With one standcock open, a jet, 60 feet in height, was produced, and 107 gallons per minute were delivered.

2nd. The second standcock was then opened, and the difference in the first jet was barely perceptible.

3rd. Other two standcocks being opened, the first jet was reduced to 45 feet in height, and the delivery to 92 gallons per minute.

4th. All the six standcocks being opened, the first jet was further reduced to 40 feet high, and the delivery to 76 gallons per minute.

3rd Experiment.—Two standcocks, with hose, &c., as in the first experiment, were then put into a service pipe, 4 inches diameter and 200 yds. long, in Tooley Street; the service pipe was connected with 200 yards of main 5 inches diameter, branching from the main of 9 inches diameter. The weather was still the same as at first, but the wind did not appear to effect the jets, owing to the buildings all round being so much higher than the jet.

1st. The standcock nearest the larger main was opened, and a jet of 40 feet high was produced, delivering 82 gallons per minute.

2nd. Both standcocks being opened, the first gave a jet of 31 feet, and delivered 68 gallons per minute.

3rd. The standcock furthest from the large main, only being opened, gave a jet of 34 feet, and delivered 74 gallons per minute.

4th. Both standcocks being opened, the furthest one gave a jet of 23 feet, and delivered 58 gallons per minute.

When both these plugs were allowed to flow freely without hose, the water from that nearest the large main rose about 18 inches, and the further one about 1 inch above the plug-box.

These and other experiments, prove the necessity of placing the plugs on the mains, and not on the service pipes, where there are mains in the street.

The plug and firecock have both certain advantages and disadvantages, which the author describes.

A plug, with a canvas cistern, is the easiest mode of obtaining water; the plug-box being only the size of a paving-stone, is no annoyance in the street, and the water has only one angle to turn before it is delivered.

On the other hand, where the supply of water is limited, the plugs give but little command of it; there is, however, comparatively very small loss at a large fire in London, from this cause, as it is very seldom that all the fire-engines can be supplied direct from the plugs, and those that arrive late, must pick up the waste water as they best can, by using another description of canvas dam, or opening the street: but in enclosed premises, especially where the water is kept for the purpose of extinguishing fires, firecocks are much to be preferred. It is very difficult to insert the standcock into a plug, if there is a considerable force of water, and if the paving has moved, it cannot be done without raising the plug-box; but this is, however, the easiest mode of using firecocks, and where there is a considerable pressure of water, if the watchmen or the police are supplied with a hose reel and branch pipe, they can, in enclosed premises, direct a jet on the fire while the engines are being prepared; and if they cannot reach the fire, they will have water ready for the engine when it arrives.

Enclosed premises are particularly mentioned, because the principal duty of the watchmen, in these cases, is to guard against fire, and their other duties being comparatively few, the men are not often changed, and they can be instructed thoroughly in the matter. With the general police of the metropolis it is quite different,—their duties are so numerous and varied, that to add that of firemen to them would only be to confuse them.

Firecocks, if kept at 9 inches to 12 inches below the surface, are easily protected from frost, by stuffing the opening with straw.

The advantage which the double firecocks have over the single ones, is merely the increased water-way, as a firecock 3½ inches diameter could not be so easily opened or shut, as two cocks of 2½ inches diameter.

One of the greatest objections to firecocks, is the very large openings required in the streets, the first cost and the repair of which are both considerable, besides their liability to accident.

To take them to the foot-path, increases the expense and diminishes the supply of water, as it is generally done with a small pipe, and the number of angles is increased. In some instances, where firecocks have been put down on one side of the street, no less than four right angles have been made in the course of the water; and if the fire happens to be on the opposite side of the street from the firecock, the thoroughfare must be stopped. The expense also is no slight consideration, for if laid along with the water-pipes, each firecock, if properly laid, and the pit built round with cement, will cost eight or ten times as much as a plug.

On the application of manual power to the working of Fire Engines.

In the application of manual power to the working of fire-engines, the principal object is, to apply the greatest aggregate power to the lightest and smallest machine; that is, suppose two engines of the same size and weight, the one with space for 20 men to work, throws 60 gallons per minute; and the other with space for 30 men, throws 80 gallons in the same time; the latter will be the most useful engine, although each man is not able to do so much work as at the former.

The reciprocating motion is generally preferred to the rotary for fire-engines. Independent of its being the most advantageous movement, a greater number of men can be employed at an engine of the same size and weight; there is less liability to accident with people unacquainted with the work, and such as are quite ignorant of either mode of working, work more freely at the reciprocating than the rotary motion. To these reasons may be added, the greater simplicity of the machinery.

Various sizes of engines, of different degrees of strength and weight, have been tried, and it is found that a fire-engine, with two cylinders of 7 inches diameter, and a stroke of 8 inches, can be made sufficiently strong at 17½ cwt. If 4 cwt. be added for the hose and tools, it will be found quite as heavy as two fast horses can manage, for a distance under six miles, with five firemen and a driver.

This size of engine has been adopted by the Board of Admiralty and the Board of Ordnance, and its use is becoming very general.

When engines are made larger, it is seldom that the proper proportions are preserved, and they are generally worked with difficulty, and soon fatigue the men at the levers. When a large engine is required in London, two with 7-inch cylinders are worked together by means of a connecting screw, thus making a jet very nearly equal (as 98 to 100) to that of an engine with cylinders 10 inches diameter; any larger size than this cannot be used, as the friction in the hose of 2½ inches diameter, is so much increased that the jet is comparatively weak; the hose may of course be enlarged in diameter, but the weight is augmented, and

the whole of the machinery is rendered more unwieldy and less useful.

A great many different shapes of jet have been tried. The old jet was a continuation in a straight line of the taper of the branch, from the size of the hose screw to the end of the jet pipe; this had many inconveniences; the size of the jet could not be increased without making the jet pipe nearly parallel. As the branches were sometimes 7 feet or 8 feet long, in some instances the orifice at the end of the jet-pipe, was larger than that at the end of the branch. The present form of the jet completely obviates this difficulty, as the end of the branch is always 1½ inches diameter.

The curve of the nozzle of the present jet is determined by its own size; one-tenth of the difference between the jet to be made and the end of the branch, is set up on each side of the diameter of the upper end of the branch, a straight line is then drawn across, and an arc of a circle described on this line, from the extremity of each end of the diameter of the jet, until it meets the top of the branch: the jet is then continued parallel, the length of its own diameter; the metal is continued one-eighth of an inch above this, to allow of a hollow being turned out to protect the edge. The rule for determining the size of the jet for inside work is, to "make the diameter of the jet one-eighth of an inch for every inch in the diameter of the cylinder, for each 8 inches of stroke." When it is necessary to throw the water to a greater height, or distance, a jet one-seventh less in area is used, with a branch from 4 feet to 5 feet long.

The usual rate of working an engine, of the size described, is forty strokes of each cylinder per minute,—this gives 88 gallons. The number of men required to keep steadily at work for 3 or 4 hours is 26; upwards of 30 men are sometimes put on when a great length of hose is necessary. The lever is in the proportion of 4¼ to 1. With 40 feet of leather hose and a ⅞ inch jet, the pressure is 30 lbs. on the square inch; this gives 10·4 lbs. to each man to move a distance of 226 feet in one minute. The friction increases the labour 2½ per cent. for every additional 40 feet of hose, which shows the necessity of having the engine, and of course the supply of water, as close to the fire as is consistent with the safety of the men at the levers.

The paper is illustrated by nine drawings (Nos. 3650 to 3658) showing the fire-engines, fire-plugs, cocks, hose-screws, jets, &c.,

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Mr. Simpson said, that the subject of Mr. Braidwood's communication was liable to so many contingencies, that it became one of extreme difficulty to lay down comprehensive rules on the question.

In rendering supplies of water available, in cases of fire, the question to be solved was, what were the appliances most likely, under all circumstances, to prove serviceable in sudden emer-

gencies, taking into account the effect of alarms of fire, and the excitement caused by them, among all classes of persons.

In the course of his practice, he had designed and executed plans for affording supplies of water in case of fire, and it was a subject to which he had occasionally paid considerable attention. He was sorry to differ, in any degree, from so good an authority as Mr. Braidwood, but he thought that the services of sunk tanks, or underground receptacles, were improperly undervalued; in small water-works, where the power of the pumping machinery was limited, and in comparatively level countries, when elevated reservoirs of magnitude could not be constructed, he knew of no plan so likely to succeed as sunk tanks; because, with trifling attention, they were not liable to be deranged, or to be affected by frost, and they were so immediately available in the hour of need; the large quantity of water required to be supplied in a short time at fires, being usually, far beyond the pumping power of small water-works. He had frequently applied tanks with success. In the fire supply at the Royal Hospital at Chelsea, three tanks, containing 5000 gallons each, were introduced, in compliance with the desire of one of the officers, in order to obtain half-an-hour's supply of water for the fire-engines of the establishment, and thus to avoid delay and afford time to communicate with the turncocks. The tanks were supplied by independent pipes connected with the water-works' main; supplies being also introduced into the building. He intended originally to have laid communicating pipes, at a low level, to admit the water to flow from any of the tanks, to those which might be in use, but vaults and other obstructions deterred him from following out this arrangement, and it was now questionable whether, with the direct communication with the water-works' main, it would have proved worth the cost of the application.

There were many situations where it would be nearly impossible to have elevated supplies of any considerable extent, and in such positions he must contend for the advantage of sunk tanks. For instance, in a very flat country, or in such a position as at Windsor Castle, which was situated upon an abrupt knoll, nearly 100 feet above the river, with the elevated land 4 miles distant; at Hampton Court Palace, where, notwitstanding the proximity of the river and other sources whence water could be procured, unless sunk tanks existed in the court-yards, to which instant access could be obtained, much injury might happen before a regular supply of water could be given, and great engine power would be wasted, in pumping it by hose from such a distance as from the river.

He concurred with Mr. Braidwood in all he had stated respecting the supply to fire-engines, but the impossibility of fixing plugs to meet all cases, and to supersede long lengths of hose, was so great, that he despaired of its accomplishment. He believed we were indebted to the Dutch for the introduction to this country

of a large portion of the present system of fire-engines and apparatus. When King William III. landed in 1688, a quantity of fire-engines and implements were brought from Holland, and up to a recent period some of them were still to be found, in several of the public buildings in London. The workmanship of the pump barrels and valves, was excellent, and the style of their construction would be creditable to the shops of our best makers, in the present day. In the year 1817, he had examined similar engines and apparatus in Cape Town, Cape of Good Hope, where the Dutch system of fire supply remained in the same state as at the capture of that colony in 1804. The Dutch were, apparently, well aware of the disadvantages of working the water from fire-engines through long lengths of hose; their fire-engines were supplied with canvass pipes, tanned inside, fitted with funnels, for conveying water from a distance to the fire-engines; and he had seen similar pipes used at Manchester, Liverpool, and other towns in England.

He was impressed with the idea, that fire-engines were too frequently inefficiently supplied with hose pipes. At the fire at the Burlington Arcade, a few years ago, long lengths of hose were indispensable, and in confined courts and passages, where fire-engines could not be worked, they were equally necessary. At a recent fire at Gravesend, he had been informed, that one of the engines was comparatively useless, for want of longer hose.

One of the great difficulties at fires, was to prevent the water from running into the sewer gratings, and to the lower parts of the roads and streets away from the sites of the fires. Some idea of the quantity of water consumed at fires might be formed, from the fact that when the Houses of Parliament were burnt down, a body of water equal to one acre in area and 12 feet deep, was supplied, and twenty-three jets of water were playing at one time.

The best way of obtaining water from the mains, was not very obvious. Plugs were the simplest contrivances, and were most generally used, but they had disadvantages as well advantages; where cocks could be applied, they were certainly preferable, but he did not approve of cone cocks; the water-ways were contracted, and the cones were liable to become set and otherwise deranged, and also to be frozen. Latterly he had applied the common screw or slide cock, used in water-works; in them, the water-ways were not contracted, and so far as his experience went, he was inclined to give a decidedly favorable opinion of them. A well-made slide cock, with gun-metal screws and nuts, would, he had no doubt, with occasional packing, last 30 years, and with trifling repairs, 30 years more.

Objections had been frequently urged to the common stand-pipes, and indeed to the use of cocks in cases of fire, as being detrimental in some respects to obtaining the water, and to their affording an opportunity for one or two engines to monopolize the

supply, to the exclusion of others; all firemen being anxious to work without the suction pipes being laid, as they too frequently were compelled to be placed in dirty kennels, or in holes dug in the streets for the purpose.

A simple mode of rendering the standcocks tight was adopted at Liverpool and Manchester; a recess was turned near the lower end, around and in which hemp strands were wrapped, and it was found, that this made a good water-tight joint, when the end was inserted into the plug-hole. The lower end of the plugs should be of a parabolic form, so as to be readily loosened, when they required to be removed. Mr. Simpson was induced to think, the canvass cistern over the plug-hole, the best mode of obtaining water in the streets, for extinguishing fires.

Objections had been urged against contracted water-ways, in such apparatus. The absorption of power by contractions in the water-ways of all fire-engine work, was seriously detrimental, the increased power required, being directly in proportion to the contraction of the water-ways. The improvements in fire-engine machinery had, of late years, been very great; in the manufacturing districts engines were used with working barrels of 9 inches or 10 inches diameter, while those in London were only 6 inches and 7 inches in diameter.

At the Royal Hospital at Chelsea before alluded to, supplies of water were introduced into the buildings in cisterns, each containing 750 gallons, with a chamber engine in each floor or ward; leather pipes and cocks were connected with the tanks, and were kept in safes, to supply the engines, which were so constructed that one man could work an engine and direct the jet at the same time. This system was applied in several large buildings, and it had worked most successfully; many instances had occurred of fires in rooms being extinguished at the outset, with trifling quantities of water.

At the Royal Mews at Pimlico, a large tank, containing 4250 gallons of water, was erected at a height of 8 feet above the ground, fitted with pipes and valves, which reacted on the line of pipes when the water main was turned off, so that the buildings had an independent supply, and, in case of a fire occurring, time was afforded to communicate with the turncocks. From the beneficial effects he had seen produced, on many occasions, by small quantities of water, at the outbreaks of fires, he was decidedly of opinion that all buildings should be furnished with such supplies and the means of applying them.

It was, he thought, unfortunate, that what might be denominated the preventive system, was not more appreciated by the public, and followed out to a greater extent. The matter, was ...ever, very perplexing; what he had known to succeed ad...bly under one management, failed from neglect ten years under another, and the destruction of the building was the ...quence.

If the system of using effectively a small quantity of water, on the first outbreak of a fire, was adopted, the loss which now almost uniformly occurred from the employment of such an excess of water would be avoided. It had been stated, that recently at Oxford, goods of the value of £10,000, had been damaged by water, in a fire-proof cellar, while a fire was being extinguished in the building above. These goods would have escaped all injury, but for the excess of water by which they were inundated.

Mr. Simpson agreed with Mr. Braidwood, that jets direct from the main could not be applied with advantage, unless very large pipes, at an enormous cost, were laid down for the purpose; and even then, a connected series of pipes, of any extent, would be liable to so many casualties, that he should hesitate to rely solely upon them. He had, however, often seen one or two jets from mains applied with success. A fire at the Foreign Office in Downing Street, about two years ago, was extinguished by this means; but in general, jets from mains would be found insufficient in number and altitude, to extinguish fires of magnitude; dependence, therefore, should not be placed upon them.

The maintenance of plugs in a proper state, in the streets of the metropolis, was a source of constant labour and anxiety; that which would answer in a small town, would not suffice in a large city. He had frequently seen the plugs on the main started, by the vibration of the heavy traffic, and considerable damage ensued before the flow of water could be stopped.

In the spaces before many of the public buildings, firecocks were fixed in tanks, large enough to contain the suction pipes of five engines; the cocks keing fitted with screws, to which filling pipes and branches for jets, could be attached; he believed these had answered extremely well, but they were of course more expensive than plugs.

He was now engaged, under the Commissioners at Liverpool, in executing a complete system of water supply for fountains, for extinguishing fires and for watering the streets. The head of water, in many parts of the town, would be equal to about 180 feet, and he apprehended some difficulty in controlling the plugs; it was probable that he should use for that purpose, a modification of the common slide cock. The metropolitan fires were generally mere pigmies, in comparison with those he had witnessed at Liverpool. Warehouses covering many acres had been destroyed, with their contents, at one fire, and the value of the cotton consumed had equalled £1000 per hour for days together.

It had been said that the supplies of water, and the means of extinguishing fires, were less effective at the present period than they were twenty years ago. He believed that opinion to be very erroneous; the number of fires arrested in their progress at the present day was very great.

In comparing the practice of former days with that of the present time, and speaking from recollection only, he should think

that a quarter of a century ago, about one-half the number of fires were attended by fire-engines at an early stage, and the disorganised state of the engine attendants was productive of serious evils. These were now remedied, and it was surprising how rapidly the intelligence of fires was communicated to the station, and the promptitude with which the engines attended. This, he believed, was in a great degree to be attributed to the system introduced by Mr. Braidwood in the Fire Brigade. The supposed increase in the number of fires, might, he believed, be traced partly to the increase of buildings, but, in a great degree, to the variety of furnaces introduced into buildings for warming and ventilating, also from carelessness in not shutting the main supply cocks of the gas pipes leading into dwellings every night; he thought that the increased publicity given to fires through the press had influenced the opinions he had referred to. He felt confident it would be found, that in fact the number of fires in the metropolis had not increased proportionably beyond that of the extension of buildings, although during the last ten years many of the fires, which had occurred, appeared certainly to have been of greater magnitude than formerly.

Mr. Braidwood presented drawings of the system of distribution of water-pipes at the British Museum and Greenwich Hospital, showing the situation of the fire-cocks. The works at both places were executed nearly in accordance with his report to the Commissioners on the subject. The latter building would be supplied from a reservoir in the park under a pressure of nearly 100 feet, and the former by the New River Company with a pressure of about 80 feet.

"On the construction and proper proportions of Boilers for the generation of Steam."—By A. Murray, Assoc. Inst. C.E.

This paper commences, by investigating the quantity of air chemically required for the perfect combustion of a given quantity of coal, of the quality commonly used for steam purposes. The amount of air to each pound of coal, is stated to be 150·05 cubic feet, of which 44·64 cubic feet are required, for the various carburetted hydrogen gases given off, and 105·71 for the solid carbon. The practical utility, however, of this knowledge, is much impaired by the circumstance, that combustion ceases even in pure oxygen, and much more in air, before the whole of the oxygen present has entered into the new chemical combinations required. It is also known, that carbonic acid gas exerts a positive influence in checking combustion, as a candle will not burn in a mixture composed of four measures of air and one measure of carbonic acid gas. Large quantities of this gas being generated by the combustion of the solid carbon on the grate, and being necessarily mechanically mixed with the inflammable gases as they

rise, the quantity of air required for their subsequent combustion must, on this account, be increased to a very large extent. The whole of the air thus supplied in excess, must be heated to a very high temperature, before any combustion can take place, and the loss of the heat thus absorbed, must be taken into account, in calculating the ultimate economy of igniting these gases.

The form of furnace now in general use, in which the fuel is spread over a large surface of fire-bar, has not been subject, in so far as affects the supply of air through the bars, to much alteration, amongst the many patents and proposals which have been made for the more complete combustion of coal. The point most open to change in the common furnace, is the width between the bars; and as it is desirable to have the supply of air to the furnace as abundant as possible, it should be made as large as can be done without causing waste, by allowing the coal to fall through into the ash-pit. A greater number of these bars is thus to be preferred to a smaller number of broad or thick bars; indeed to such an extent is this carried in France, where coal is more valuable than in this country, and the chemistry of the subject perhaps more generally understood, that the bars are made not more than half an inch thick, the necessary strength being obtained by making them 4 inches deep. With coke or wood, which cannot fall through the bars and be wasted, in the same way as coal, the space is always made much wider, and with great advantage; so much so with coke, as to have led to the opinion that a given quantity of coke would produce as much heat by its combustion as the coal from which it was made. Any grounds for such an opinion, could only have arisen from the combustion of the coal having been so imperfect, that not only had the whole of the gases passed off unconsumed, but even a large portion of the solid carbon must have been allowed to escape in the form of carbonic oxide, without having generated its due amount of heat, and being converted into carbonic acid gas.

In the combustion of coke, or of the solid portion of coal, as left in an incandescent state on the fire-bars of a common furnace, after the volatile gases have passed off, the amount of heat generated by the whole of the carbon, uniting at once with its full amount of oxygen, will be the same as what would be generated by its combination, first, with a smaller quantity of oxygen, forming carbonic oxide; and subsequently, by the ignition of this gas, by its combination with the further quantity of oxygen, required to turn it into carbonic acid gas.

As some portion of the carbon is always converted into carbonic acid gas in the furnace, it follows, that the air for the ignition of any carbonic oxide there formed, and allowed to pass into the flues, must be greatly in excess of the quantity chemically required; and the whole of this excess must be raised to the temperature of the other gases with which it will be mingled. The

superior economy, therefore, of at once converting the whole of the carbon into carbonic acid gas, is apparent; and there is no doubt, but that this very desirable result may be obtained nearly to the full extent, by due care in the formation, and subsequent management of the furnace.

The best mode of supplying air to the other inflammable gases resulting from the combustion of bituminous coal, which are composed of hydrogen and carbon, and which will be treated of under the common name of carburetted hydrogen, has been a matter of much controversy, and been the subject of many patents. The mode proposed by the greater number of the patentees is, to admit the air immediately behind the furnace, at the back of what is termed the bridge. A bridge does not exist in every case; but where it does exist, it is generally in the form of a wall or obstruction, right across the back of the furnace; often placed there for no other purpose, than to prevent the fire from being pushed back into the flue. The whole of the products of combustion, as formed in the furnace, necessarily pass over this bridge before entering the flue. The additional air is sometimes heated, previously to its being admitted to the gases, after they have left the furnace, and the manner in which it is supplied, varies exceedingly; one party advocating its admission in a long thin film, another through a great number of small orifices, and others again attach less importance to the manner of its admission, so that it is only admitted in sufficient quantity. All these plans proceed upon the supposition, that large quantities of inflammable gas pass off from the furnace, and as none of them directly affect the operations going on within the furnace itself, the gases which are actually given off, would be the same until they pass over the bridge, whichever plan might be adopted.

These plans must all cease to be necessary or useful, if a furnace can be so constructed, and the combustion of the coal in it so managed, that a very small proportion only of uncombined inflammable gases would pass off, as in this case no economy would result from their combustion, owing to the large excess of air, which must be supplied and heated as before explained.

The admission of a large quantity of air into the flue, at a distance from the furnace, though advocated by some authorities, cannot be advantageous, unless in extreme cases, when the temperature in the flue is very high, and where the combustion in the furnace has been more than usually imperfect.

As the carburetted hydrogen gases are generated rapidly, on the application of heat to the coal, and are in themselves much lighter than the carbonic acid gas, or the nitrogen gas, formed at the same time, it is sometimes assumed, that they rise nearly unmixed to the top of the space over the furnace, and thence it is considered more advantageous to supply the air at this place than in the flue. The cooling effect of air, if admitted into the furnace, has been stated to be more injurious than if admitted into the

flue; but the correctness of this statement may be doubted, especially if the gases be unmixed, as this would render a much less quantity of air sufficient.

The bars in this case should be placed at least 2½ feet or 3 feet below the boiler, or the crown of the furnace, to allow the principle to be more fully carried out. An increase of space over the bars to this extent, has always been found to be advantageous, and ought to be particularly attended to. The system of admitting the air to the gases, in a subdivided form, in whatever part of the boiler the admission of it may take place, is very efficacious in procuring a thorough and speedy mixture of the particles. It has been very extensively and successfully introduced by Mr. C. W. Williams, in supplying air behind the bridge of the furnace.

An opinion is entertained that a sufficient supply of air for the gases may be obtained through the fire-bars; and it is obvious, that a partial supply at least, may be obtained in this manner, by a judicious management of the fire. This may be effected by keeping the fires thin and open, feeding by small quantities at a time, or by a system of coking the coal, allowing the combustion of it to be slow at first, by which means the coal is formed into masses of coke, between which the air has a passage. The air which passes through, is not vitiated further than in being mechanically mixed with the carbonic acid and nitrogen gases, caused by the combustion of the coal on the bars.

The perfect combustion of the whole ingredients of coal being entirely dependent, chemically considered, on the supply of the due quantity of atmospheric air, it is evident that the velocity with which the air flows into the fire, will materially affect the result. According as this velocity is greater or less, so in proportion must the quantity of coal that is to be consumed on a given area of grate, be increased or diminished, and there is no limit to the quantity that may be so consumed, beyond the difficulty of supplying the air sufficiently rapidly. The various circumstances which affect the velocity of the entering air, have placed this question, as yet, completely beyond the reach of theory, so that practical experiments must be taken as the only guide, in determining what quantity of air can be made to enter into a given furnace, and consequently, what amount of coal can be properly consumed in it, in a given time.

Mr. Parkes has stated, as the result of a long series of experiments made by him, that the rate of combustion should not exceed 7 lbs. per superficial foot of grate bar per hour, and that this quantity may with advantage be reduced as low as 4 lbs. or even 3 lbs. General experience would tend to prove, that these latter quantities are unnecessarily low, and can only be advantageous, when the arrangements for supplying the air, or for carrying off the products of combustion, are defective or inefficient. It is evident, that if the area of any part of the passage, for

either of these currents, is too limited, the velocity at this contracted spot cannot rise higher than is due to the weight of the ascending column of heated gases in the chimney. The quantity passing through is therefore diminished in proportion as the area is limited; and a good draught at a particular place, as at the bridge of a boiler, may here be quite compatible with an insufficient supply of air, and imperfect combustion of the coal. The draught in every other part of the flues is, at the same time, rendered slow and languid, and deposition of soot takes place in them. This fault is apparent in a great number of boilers at present in use, and in some cases, especially in tubular boilers, it is attended with very injurious results, by stopping up the tubes and decreasing the amount of heating surface to such an extent, as to render the boilers incapable of generating the required amount of steam.

The furnaces of the boilers in general use in Cornwall, are upon the common principle of construction, and as in them it is not usual to apply any of the peculiar patented arrangements, for the supply of air to the gases, behind the bridge, it follows, either that these gases are not consumed, or that they are consumed by air admitted through the bars. In the Cornish system of raising steam, slow combustion is adopted in its fullest extent; the fires are kept thin and open, the fuel is supplied in small quantities, and frequently, and it is well spread over the whole surface. As the result is highly favorable in the economy of fuel, it may be presumed that the combustion of the gases, as well as of the solid carbon, is comparatively perfect. When more air is admitted into the furnace than can be made to enter through the bars, it is generally done by apertures in the furnace doors.

The average rate of combustion throughout the country, is far above even the largest quantity named by Mr. Parkes, and may be stated to be about 13 lbs. per superficial foot of grate per hour. With due care in the construction of the furnaces and flues, there seems to be no reason why this quantity may not be as perfectly consumed, and the heat as thoroughly extracted from the products of combustion, before they leave the boiler, as with the smaller quantity. Whether this be so or not, it is necessary in practice, to prepare for many cases, as on board of steam-vessels, where it is impossible to allow a larger amount of fire-grate, or boiler-room, and when it would cease to be ultimately economical to obtain a small saving of fuel, by great additional expense in boilers and their fittings, and in space for them.

To determine the velocity with which the products of combustion pass off from the furnace, or from the boiler, is attended with much difficulty, on account of the great number of extraneous circumstances, which do so easily and so constantly affect it. Some experiments on this subject were made by Dr. Ure, and an account of them was read before the Royal Society, when he stated, that he considered the velocity might be taken at about

36 feet per second, and as this result has been corroborated by others, it may be assumed, in the absence of better data, as nearly correct.

The subject, in a theoretical point of view, is surrounded by many difficulties—in discovering the allowance which must be made for friction, and other circumstances, similar to those affecting the flow of water through pipes; and though this latter has engaged much more of the attention of scientific men, no very definite results, to bear accurately upon practice, can yet, even in this case, be obtained by calculation.

The practical question of the proper proportions of the different parts of boilers, is then proceeded with in the paper, the leading chemical and physical features, connected with the combustion of coal in their furnaces, having been considered.

The supply of the requisite quantity of air to the fuel on the bars, being of the utmost importance, it is usual to make the ash-pit, and the entrance to it, as large and as free as the situation will allow. In marine boilers, or wherever it is necessary to limit the size of the ash-pit, the area for the entrance of the air into it, should never be less than one-fourth part of the area of the grate; and in order to facilitate the supply to the back part of the grate, the bars should be made to incline downwards to the extent of about 1 inch in a foot. No advantageous results will be obtained from increasing the ash-pit, as is sometimes done in land-boilers, to a very great extent, by making it 5 or 6 feet deep; about $2\frac{1}{2}$ feet is sufficiently deep, even supposing that the ashes are not cleared out oftener than once a day.

The extent of 'dead plate' in front of the furnace is not material, as respects combustion; in marine-boilers, it is generally not more than about 6 inches broad, which is the width of the water space between the fire and front of the boiler; but in land boilers it is frequently required to be very broad, to support the brick-work, especially in those cases where the flue is carried across the front.

The amount of the opening between the bars, should be about $\frac{7}{16}$ths of an inch, but this must be regulated by the kind of coal to be burnt upon them; but for any kind of coal, it should not be less than $\frac{3}{8}$ths of an inch, nor more than $\frac{1}{2}$ an inch. If the space were made larger, the waste from the amount of cinders, or of small pieces of coke, which would fall through in a state of incandescence, would be considerable; otherwise it would be preferable to have a larger space. In order to facilitate the supply of air, each bar should be as thin as is consistent with the strength required. The bars in general use in this country, are 1 inch or $1\frac{1}{8}$ inch in thickness, but it would be much more advantageous to use them thinner, as in France, where they are frequently used not more than $\frac{1}{2}$ inch thick.

[*To be continued.*]

ELECTRIC TELEGRAPHS.

Among the many wonders connected with modern discoveries in science, it is not the least curious to watch the simultaneous development of the secrets of Nature in different countries. The announcement of the Daguerreotype, which threw all the savans of Europe into amaze, was quickly succeeded, and apparently without any connection with the first discoverer, by improvements from America, which so much facilitated the process of obtaining representations from nature, that portraits, as well as landscapes, were readily produced. A simultaneous promulgation also occurred in the case of the electrotype process, the originality of which was claimed both for England and Russia. But of all the modern discoveries in nature, that which promises the most beneficial results, is the application of electricity as a means of transmitting communications; and in this case also we find two parties claiming the merit of originality. In England we find the names of Messrs. Cook and Wheatstone, in conjunction, and likewise Mr. Bain; and in the United States, the honor of this novel adaptation of electricity is awarded to Professor Morse. It will perhaps be interesting to shew what has been done by this gentleman, with the assistance of Professor Page's discoveries in electro-magnetism. For the following papers we are indebted to the Annual Report of the Commissioner of Patents for the United States, a work to which we have before had occasion to refer, and one we should be glad to see imitated in this country.

Improvements in the Magneto-electric Machine, and application of this instrument to operate the Magnetic Telegraph.

The magneto-electric machine was originally contrived by Mr. Saxton, soon after the commencement of the interesting discovery of Faraday that magnetism was capable of exciting electricity. The conditions necessary for obtaining electricity in this way, were, chiefly, the disturbance of magnetic forces in a bar of soft iron, surrounded by coils of wire. A number of mechanical contrivances were resorted to, in order to effect this disturbance, by causing the bar of iron, thus surrounded, to approach to, and recede from, the poles of powerful magnets; but the ingenuity of Mr. Saxton far exceeded them all, by giving to the coils and enclosed bar a rotary movement about the poles of a U-form magnet. This instrument afforded bright sparks and strong shocks; but the currents of electricity thus obtained could not be converted to any useful purpose, as, in each half revolution of the coils, the currents were in opposite directions. In 1838, Professor Page published in Silliman's Journal an account of an improved form of the machine, doing away with many existing objections, and furthermore rendering it at once a useful instrument, by a contrivance for conducting these opposing currents

into one channel or direction, which part of the contrivance was called the unitress. The current produced in this way was capable of performing the work, to a certain extent, of the power developed by the galvanic battery; and the machine was found adequate to the furnishing of shocks for medical purposes, for exhibiting the decomposition of water, furnishing the elements oxygen and hydrogen at their respective poles, and producing definite electro-chemical results. These two last results could not be obtained without the aid of the unitress. But, with this improvement, the instrument was still wanting in one property of the galvanic battery—viz: that property which chemists call quantity, or that power upon which depends its ability to magnetize, and also to heat platinum wires. This last property has been given to the machine by the recent contrivance of Professor Page. The machine, in its novel construction under his improvement, developed what is called, by way of distinction, the current of intensity, but had a very feeble magnetizing power. By a peculiar contrivance of the coils, (not to be made public until his rights are in some way secured,) the current of quantity is obtained in its maximum, while, at the same time, the intensity is so much diminished, that it gives scarcely any shock, and decomposes feebly. It has been successfully tried with the magnetic telegraph of Professor Morse, and operates equally well with the battery. It affords, by simply turning a crank attached to the machine, a constant current of galvanic electricity; and as there is no consumption of material necessary to obtain this power, it will doubtless supersede the use of the galvanic battery, which, in the event of constant employment, would be very expensive, from the waste of zinc, platinum, acids, mercury, and other materials used in its construction. It particularly recommends itself for magnetizing purposes, as it requires no knowledge of chemistry to insure the result, being merely mechanical in its action, and is always ready for action without previous preparation; the turning of a crank being the only requisite when the machine is in order. It is not liable to get out of order; does not diminish perceptibly in power when in constant use, and actually gains power when standing at rest. It will be particularly gratifying to the man of science, as it enables him to have always at hand a constant power for the investigation of its properties, without any labour of preparation. We notice among the beautiful results of this machine, that it charges an electro-magnet so as to sustain a weight of 1000 pounds, and it ignites to a white heat large platinum wires, and may be used successfully for blasting at a distance; and should Government ever adopt any such system of defence as to need the galvanic power, it must supersede the battery in that case. Professor Page demonstrates, by mathematical reasoning, that the new contrivance of the coils affords the very maximum of quantity to be obtained by magnetic excitation.

MORSE'S ELECTRO-MAGNETIC TELEGRAPH.

The electro-magnet is the basis upon which this whole invention rests in its present construction; without it, it would entirely fail. The electro-magnet is produced by coiling around a bar of soft iron, made in the form of a horse-shoe, (fig. 1,) copper wire

Fig. 1.

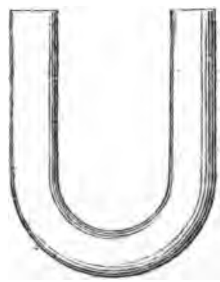
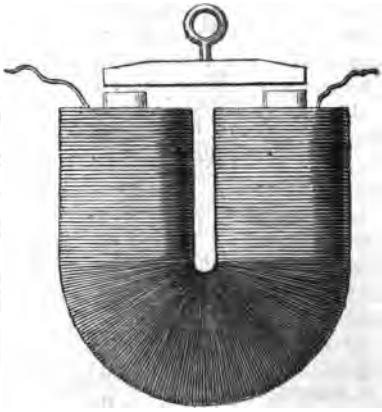


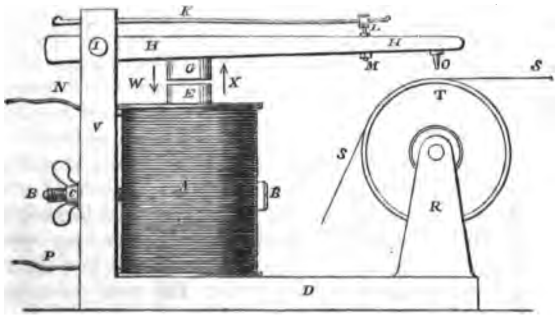
Fig. 2.



previously covered, similar to bonnet-wire, and varnished to prevent metallic contact with each other and the iron, (fig. 2). The two terminations of the wire thus surrounding the iron in a spiral form, are brought out at each end of the curved bar, and are connected, one with a zinc pole of a galvanic battery, the other with the platinum; the battery being prepared in the usual manner with its corroding acid, produces galvanic electricity, which starts off from one pole of the battery, follows the wire around the soft iron, and returns to the other pole of the battery by the other wire—thus forming a complete circuit. The galvanic fluid is now passing the whole length of the wire, and, while thus passing, the curved iron becomes a strong magnet. By connecting the two ends of the bent iron with a bar of similar soft iron, it will support many pounds weight. If, while in this condition, one of the wires is removed from the battery, the cross-bar falls, and with it its weights. The curved iron returns instantly to its original state. It is unmagnetized. Complete the circuit, as at first, and in an instant it is again a magnet. Break the circuit, and it ceases to be a magnet. If the battery is placed 100, or 1000, or 10,000 feet from the magnet, yet, when the one is connected with the other by intervening wires, the effect upon the magnet is the same—making it a magnet when the circuit is complete, and *vice versa* when it is broken. In this way, power is produced at a point of considerable distance from the generating agent, and wholly at the command of the operator at the

battery to make or destroy the power produced, with the utmost possible rapidity.

Fig. 3.



The above figure represents the most simple form of the electro-magnet, with its appropriate machinery for telegraphic purposes. A, represents a side view of the bent iron bar, surrounded with its coils of copper wire, standing upon a platform D. V, being an upright arm secured to D, to which the magnet, or soft iron, is permanently fastened by means of the bolt B, B, B, passing between the prongs of the curved iron, and through the board V, and adjusting screw C. E, is the projecting prong of the iron, after it has passed through the coils—one only being seen. The other prong is directly behind E. G, represents the end of the iron bar or keeper, extending back so far as to cover both the projecting ends of the horseshoe-formed magnet. This iron bar or keeper is fastened to the lever H, H, which is delicately adjusted, so as to rise and fall by a pivot at I. K, represents a steel spring over the lever H, H, and passes through a loop-hole L, formed from a brass wire; the lower part of the brass wire being secured to the lever H, H, by means of a screw at M. O, is a hardened steel point, similar to those used by manifold letter-writers, and is also connected with the lever H, H, and directly over the centre of the metallic roller T, in which a slight groove is made to correspond with the point of O. R, represents the standard in which the axis of the roller T, freely revolves, and is a part of D. The line S, represents the paper, in form of a ribband, passing from its coil between the roller and the point of O. N, and P, are the two extremities of the wire upon the magnet A. Every part is now described; and, from what has preceded the description, bearing in mind the effect of the battery when in action upon the soft iron, by forming a complete circuit with the wires N and P, the mode of writing by the instrument may be easily comprehended by what follows. Complete the circuit, and instantly the cross-bar G, approaches the ends of the *magnet* E, until they meet in the direction of arrow W. Break the circuit, and G, is carried up in the direction of arrow X, by means of the spring K. If to the roller T, clock-work is attached, to give it a

uniform movement upon its axis, the paper s, will move with the same uniform motion under the point o; then, by completing the circuit, the point o, is brought down upon the paper, which is indented to such a degree as to make it perfectly apparent, and continues to mark it in that manner so long as the circuit is closed; but, upon breaking the circuit, the marking ceases, and the point o, flies from the paper, which continues passing on. If the circuit is closed and broken with the utmost rapidity, then a succession of dots and spaces upon the paper appears. If the circuit is successively closed and broken with less rapidity, short lines and intervening short spaces are made. If closed for a longer time and broken in succession, then the marks become longer; so that dots, short lines, long lines, and short or long spaces, are made, according to the time the circuit is closed, and the rapidity with which the paper moves under the pen. An arbitrary arrangement of these dots, short and long spaces and lines, constitutes the telegraphic alphabet; by means of which, intelligence to any extent is communicated. Thus, one dot may represent A, two dots B, three dots C, one dot and a line D, &c. The paper to be imprinted is fixed upon a revolving cylinder, and records despatches day and night; and this without ink, as the impressions are easily read even by the blind. The records of the night continue entered on the morning. The alphabet is easily learned.

Extracts from a letter addressed by Professor Morse to the Secretary of the Treasury, relative to the magnetic telegraph.

That which seemed to many chimerical at the time, is now completely realized. The most sceptical are convinced; and the daily and hourly operations of the telegraph, in transmitting information of any kind, are so publicly known, and the public feeling in regard to it so universally expressed, that I need here only give a few instances of its action, further to illustrate its character.

The facts in relation to the transmission of the proceedings of the Democratic Convention at Baltimore, in May last, are well known, and are alluded to in my report to the department, June 3, 1844. (House Doc. No. 270, 28th Cong., 1st sess.) Since the adjournment of Congress in June last, and during the summer and autumn, the telegraph has been in constant readiness for operation, and there has been time to test many points in relation to it, which needed experience to settle.

For more, now, than *eight months*, the conductors for the telegraph, carried on elevated posts for forty miles, have remained undisturbed from the wantonness or evil disposition of any one. Not a single instance of the kind has occurred. In several instances, indeed, the communication has been interrupted by accidents, but then only for a very brief period.

One of these was by the great fire in Pratt Street, Baltimore,

which destroyed one of the posts, and consequently temporarily stopped the communication; but in two or three hours the damage was repaired, and the first notice of the accident, and all the particulars, were transmitted to Washington by the telegraph itself.

Another instance of interruption was occasioned by the felling of a tree, which accidentally fell across the wires, and at the same time across the railroad track—stopping the cars for a short time, and the telegraphic communication for two hours.

Excepting the time excluded by these, and two or three other similar accidental interruptions, and which, during seven months of its effective existence between the two cities, does not altogether amount to more than twenty-four hours, the telegraph has been either in operation, or prepared for operation, at any hour of the day or night, irrespective of the state of the weather,

It has transmitted intelligence of the greatest importance. During the troubles in Philadelphia the last summer, sealed despatches were sent by express from the mayor of Philadelphia to the President of the United States. On the arrival of the express at Baltimore, the purport of the despatches transpired; and while the express train was in preparation for Washington, the intelligence was sent to Washington by telegraph, accompanied by an order from the president of the railroad company to prevent the Washington burden train from leaving until the express should arrive. The order was given and complied with. The express had a clear track; and the President and the cabinet, being in council, had notice both of the fact that an express was on its way with important despatches to them, and also of the nature of those despatches; so that, when the express arrived, the answer was in readiness for the messenger.

In October, a deserter from the United States ship Pennsylvania, lying at Norfolk, who had also defrauded the purser of the ship of some 600 or 700 dollars, was supposed to have gone to Baltimore. The purser called at the telegraph office in Washington, stated his case, and wished to give notice in Baltimore, at the same time offering a reward for the apprehension of the culprit. The name and description of the offender's person, with the offer of the reward, were sent to Baltimore, and in ten minutes the warrant was in the hands of the officers of justice for his arrest; and, in half an hour from the time that the purser preferred his request at Washington, it was announced from Baltimore by the telegraph, "The deserter is arrested; he is in jail. What shall be done with him?"

To show the variety of the operations of the telegraph, a game of drafts and several games of chess have been played between the cities of Baltimore and Washington, with the same ease as if the players were seated at the same table. To illustrate the independence of the telegraph of the weather and time of day, I would state that, during the severe storm of the 5th of December, when the night was intensely dark, the rain descending in tor-

rents, and the wind blowing a gale, it seemed more than ordinarily mysterious to see a company around a table in a warm retired chamber on such a night in Washington, playing a game of chess with another company similarly situated in Baltimore—the darkness, the rain, and the wind being no impediment to instantaneous communication.

In regard to the quantity of intelligence which may be sent in a given time, it is perfectly safe to say that thirty characters can be transmitted in a minute by a single instrument; and, as these characters are conventional signs, they may mean either *numbers, letters, words*, or *sentences*.

As an illustration of this point, I will state that nearly a whole column (more than seven-eighths) in the Baltimore Patriot was transmitted in thirty minutes—faster than the reporter in Baltimore could transcribe.

This fact bears upon the ability of producing a revenue from the telegraph; and I would suggest the propriety of permission being granted by Congress to the department to adjust a tariff of charges on intelligence sent by telegraph, at such a rate of postage as shall at least return to the treasury the interest of the capital expended in the first construction and the after maintenance of the telegraph.

* * * * * * *

In the absence of experience, the expense necessary to construct and to maintain a system of electro-magnetic telegraphs was thought to be so great as to present a formidable, if not an insurmountable, obstacle to its adoption. But the experiment already made for forty miles has shown that the electro-magnetic telegraph is far from being expensive either in its first construction or after maintenance, especially when its vast superiority over the old system is taken into consideration.

To make this more clear, I give an abstract both of the expenses and capacities of the ordinary visual telegraphs in some of the European countries.

In England, the semiphore telegraph established between London and Portsmouth (a distance of seventy-two miles) is maintained by the British government at an average expense of £3,405, or 15,118 dollars per annum. From a return (vol. 30, 1843, accounts and papers of House of Commons) of the number of days during which the telegraph was *not available* on account of the weather during a period of three years, it appears that there were in that time 323 days in which it was useless, or nearly *one year out of three!* But by a return made to the admiralty of the number of hours in the day appointed for working the telegraph, it appears that the hours appointed for the year are—from the 1st of October to the 28th of February, from 10 o'clock a. m., to 3 p. m.—5 hours; from the 1st of March to the 30th of September, from 10 o'clock a. m., to 5 p. m.—7 hours.

Average number of hours per day in the most favorable weather, 6 hours!

Deducting one year from the three for unavailable days, the average time per day for the three years would be but 4 hours. So that for the use of their telegraph for seventy-two miles, and for only 4 hours in the day, the British government expend 15,118 dollars per annum.

The French system of telegraphs is more extensive and perfect than that of any other nation. It consists at present of five great lines extending from the capital to the extreme cities of the kingdom, to wit:

The Calais line, from Paris to Calais	152 miles.
The Strasbourg line, from Paris to Strasbourg	255 ,,
The Brest line, from Paris to Brest	325 ,,
The Toulon line, from Paris to Toulon	317 ,,
The Bayonne line, from Paris to Bayonne	425 ,,

—making a total of 1,474 miles of telegraphic intercourse. These telegraphs are maintained by the French government at an annual expense of over 1,000,000 of francs, or 202,000 dollars.

The whole extent, then, of the French lines of telegraph is 1,474 miles, with 519 stations; and (if the estimate for six stations, at an average cost of 4,400 francs, is a criterion for the rest) erected at a cost of at least 880 dollars each—making a total of 456,720 dollars.

The electro-magnetic telegraph, at the rate proposed in the bill, (to wit, 461 dollars per mile, and which it should be remembered will construct not *one* line only, but *six*,) could be constructed the same distance for 619,515 dollars—not one-third more than the cost of the French telegraphs. Even supposing each line to be only as efficient as the French telegraph, still there would be six times the facilities for not one-third more cost. But when it is considered that the French telegraph, like the English, is unavailable the greater part of the time, the advantages in favor of the magnetic telegraph become more obvious.

An important difference between the two systems is, that the foreign telegraphs are all a burden upon the treasury of their respective countries; while the magnetic telegraph proposes, and is alone capable of sustaining itself and of producing a revenue.

Another difference in the two systems is, that the stations in the foreign telegraphs must be within sight of each other: a fact which bears essentially on the cost of maintenance. The French telegraph requires for the distance of 1,474 miles, no less than 519 stations—averaging *one for about every three miles.* The number of stations of the magnetic telegraph, on the contrary, is optional. The two stations (one only at Baltimore and one at Washington) shew that they may be at least 40 miles apart, and there is no reason to doubt, from experiments I have made, that 100 miles, or even 500 miles, would give the same results. In the maintenance, therefore, of stations, the magnetic telegraph would require but 15 stations, (assuming that 100 miles is the

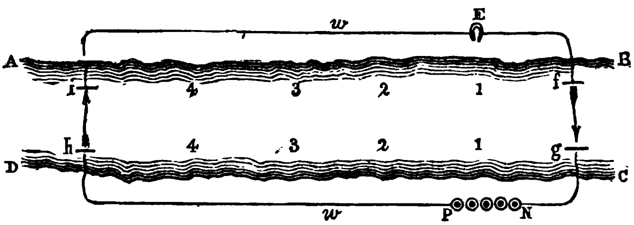
utmost limit of transmission between two stations, which is not probable;) while the French requires 519 for the same distance.

When to this are added the facts, that the magnetic telegraph is at *all times available*, at *every hour of the day or night, irrespective of weather:* that, in comparison with the visual telegraphs, it communicates *more than a hundredfold* the quantity of intelligence in the same time; that it is originally constructed at a *less cost (all things considered;)* that it is *maintained for less;* and that it is capable, by a rate of charges for transmitting intelligence, not only of defraying all its expenses, but, if desired, of producing a revenue;—I may be permitted to hope that, when these great advantages are fully understood, my system will receive that attention from the government which its intrinsic public importance demands.

* * * * * * *

In the autumn of 1842, at the request of the American Institute, I undertook to give to the public in New York a demonstration of the practicability of my telegraph, by connecting Governor's Island with Castle Garden—a distance of a mile; and for this purpose, I laid my wires properly insulated beneath the water. I had scarcely begun to operate, and had received but two or three characters, when my intentions were frustrated by the accidental destruction of a part of my conductors by a vessel, which drew them up on her anchor and cut them off. In the moments of mortification, in a sleepless night, I devised a plan for avoiding such an accident in future, by so arranging my wires along the banks of the river as to cause the water itself to conduct the electricity across.

The experiment, however, was deferred till I arrived at Washington; and on December 16th, 1842, I tested my arrangement across the canal, and with success. The simple fact was then ascertained, that electricity could be made to cross a river without other conductors than the water itself; but it was not until the last autumn that I had the leisure to make a series of experiments to ascertain the law of its passage. The following diagram will serve to explain the experiment.



A, B, C, D, are the banks of the river; N, P, are the battery; E, is the electro-magnet; *w, w,* are the wires along the banks, con-

necting with copper plates, *f*, *g*, *h*, *i*, which are placed in the water. When this arrangement is complete, the electricity generated by the battery, passes from the positive pole P, to the plate *h*, across the river, through the water to plate *i*, and thence around the coil of the magnet E, to plate *f*; across the river again to plate *g*, and thence to the other pole of the battery N. The numbers 1, 2, 3, 4, indicate the distance along the bank, measured by the number of times of the distance across the river.

The distance across the canal is 80 feet; on August 24th, the following were the results of the experiment:—

No. of the Experiment.	No. of Cups in Battery.	Length of conductors *w*, *w*.	Degrees of Motion of Galvanometer.	Size of the Copper Plates, *f*, *g*, *h*, *i*.
1	14	400	32 & 24	5 by 2½ ft.
2	14	400	13½ & 4½	16 " 13 in.
3	14	400	1 & 1	6 " 5 in.
4	7	400	24 & 13	5 " 2½ ft.
5	7	300	29 & 21	5 " 2½ ft.
6	7	200	21½ & 15	5 " 2½ ft.

Showing that electricity crosses the river, and *in quantity in proportion to the size of the plates in the water*. The *distance of the plates on the same side* of the river *from each other*, also affects the result. Having ascertained the general fact, I was desirous of discovering the best practical distance at which to place my copper plates; and, not having the leisure myself, I requested my friend, Professor Gale, to make the experiments for me. * * * * * *

As the result of these experiments, it would seem that there may be situations in which the arrangements I have made for passing electricity across the rivers may be useful, although experience alone can determine whether lofty spars, on which the wires may be suspended, erected in the rivers, may not be deemed the most practical. The experiments made were but for a short distance; in which, however, the principle was fully proved to be correct.

It has been applied, under the direction of my able assistants, Messrs. Vail and Rogers, across the Susquehannah river, at Havre-de-Grace, with complete success—a distance of nearly a mile.

I have as yet said nothing on the telegraph as a mighty aid to national defence. Its importance in this respect is so obvious, that I need not dilate. The importance generally to the government, and to the country, of a *perfect* telegraphic system, can scarcely be estimated by the short distance already established between Baltimore and Washington; but when all that transpires

of public interest at New Orleans, St. Louis, Pittsburg, Cincinnati, Buffalo, Utica, Albany, Portland, Portsmouth, Boston, New York, Philadelphia, Baltimore, Washington, Norfolk, Richmond, Charleston, Savannah, and at all desired intermediate points, shall be *simultaneously* known in each and all these places together,—when all the agents of the government in every part of the country are in instantaneous communication with head-quarters,—when the several departments can at once learn the actual existing condition of their remotest agencies, and transmit at the moment their necessary orders to meet any exigency,—then will some estimate be formed both of the powers and advantages of the magnetic telegraph.

Scientific Adjudication.

NORTHERN CIRCUIT, LIVERPOOL,

Before Mr. Justice Cresswell and a Special Jury.

August 27, 1845.

NEWTON *v.* THE GRAND JUNCTION RAILWAY COMPANY.

THIS was an action to recover damages for the infringement of a patent granted to the plaintiff (Newton) for "improvements in the construction of boxes for the axles or axletrees of locomotive engines and carriages, and for the bearings or journals of machinery in general; and also improvements in oiling or lubricating the same;" which invention was communicated to the patentee by an American engineer of the name of Babbitt.*

The invention consisted of a coating of soft metal, of which block tin was the basis laid upon a hard metal box or bearing, and the advantages derived from it were shewn to be the prevention of heating, and consequent reduction of wear and tear, and consumption of oil. It appeared, that in the autumn of 1843, Mr. Babbitt had come over to England for the purpose of introducing the invention into this country. He obtained permission from the Liverpool and Manchester Railway Company to fit up two of their engines with it; and so fully was it found to possess the advantages before mentioned, that the Company introduced it into all their engines and carriages, and now use nothing else. Several bearings which had run upwards of 20,000 miles without the slightest repair were produced, and presented a face like polished silver. The infringement complained of in this action, was the defendants' use of a tin coating, though not of the precise thickness, nor fastened in the exact manner recommended in the specification. It appeared that the defendants, by using a thinner coating, were enabled to dispense with the ledges de-

* For specification of this patent, see Vol. XXV., p. 27, London Journal.

scribed in the patent for fixing the soft metal, though less advantage was thereby derived. The principle defence set up was, that the coating was not a *new* invention, and that the patentee's mode of fastening it, not being adopted, there was no infringement of the patent. There was also a plea denying the utility of the invention, but the defendants' counsel disclaimed all objection on that ground. Mr. Robert Stephenson, Mr. Cubitt, and other eminent engineers, besides Mr. Hick, Mr. Fairbairn, Mr. Fothergill, and other extensive engine-builders and machine-makers, from all parts of the kingdom, proved that the invention was wholly unknown before the date of the plaintiff's patent, and had never been used, either in locomotive engines or other machinery, and that all the advantages claimed by the patentee had been found to arise from it. It appeared also, that the Great Western, South Eastern, Eastern Counties, and Liverpool and Manchester Railways used it under licenses from the patentee, but that the defendants had refused to pay so much as those companies for a license, or to admit that their mode of proceeding was an infringement of the patent. Some mechanics were called on their behalf, who proved that they had occasionally repaired old bearings, in some descriptions of machinery, by filling up the worn parts with solder; but they confessed that they had only done it by way of *make-shift*, to save putting in a new bearing. And one of their witnesses, a Mr. Hodge, stated, that he had, many years since, made a small lathe, the bearings of which he had coated with tin, but the instrument was not produced.

SUMMING UP.

Mr. Justice Cresswell.—Gentlemen of the jury, the plaintiff in this action complains against the defendants for pirating his patent, that is, for the using the whole, or some part of it: and if he has a good patent, and they have used any part of that which is his patent-right they are responsible for it. The defendants have put upon the record a great many pleas, and it will, perhaps, assist you materially in disposing of the case if we at first lay out of consideration those pleas about which there is no controversy. The first plea that he uses is "not guilty," which we will reserve. Then, that the plaintiff was not the first and true inventor. The plaintiff does not claim to have been the first discoverer, but to have been the person to whom that invention was communicated from abroad by a foreigner, which means, he did not acquire his information from any source of knowledge which was open to him in this country, but he derived it from a communication from a foreigner. Now there is no evidence at all to shew that the plaintiff derived his information from anybody else but a foreigner, and certainly there is a good deal of evidence from which you may conclude he did derive his information from a foreigner, namely, Mr. Babbitt, because Mr. Babbitt was over here in 1843, was permitted to try these boxes upon the Liverpool and Manchester Line, and after that the patent was taken out. Now, though somebody else may have invented it also, although it may have been in use before, yet if the plaintiff did not derive his information from the former use of it in this country, or

from any person in this country, or from any source of information in this country, but in the manner specified, then he is, in the eye of the law, an inventor, and you may find him to be the first and true inventor, within the meaning of that plea.

Then the next issue is, that he did not enrol the specification,—that is clearly proved.

Then that he did not particularly describe the invention in his specification,—that is clearly proved, because all the persons to whom the question was put, say that a person of any competent skill in mechanics, could work from the description given in the specification.

Then it is said that that the invention is no improvement. For that purpose you must take the whole of the invention for which the patent was granted,—there does not appear to be the least question on the evidence that it was a great improvement.

Then they say, that the invention, at the time of the patent, was not a new manufacture, which others did not use, within the meaning of the statute. That makes it necessary that I should direct your attention to the statute under which these patents are granted. In the reign of James the 1st, a statute passed, making illegal all monopolies; but there was this reservation in the statute, "That the declaration before mentioned shall not extend to letters patent, and grants of privilege for the term of 14 years next thereafter to be made, for selling, making, or working, any new manufacture within this realm, which others, at the time of making such letters patent and grant, shall not use." And therefore the meaning of this is, that that for which the patent was granted, was not a new manufacture within this kingdom; not used by other people.

Now with respect to this issue, you must take the whole of that for which the patent is granted, including the fillets within the outer case, as well as the lining with tin and the soft metal; and taking the whole of that together, it was not disputed, and, as I understand, was not intended to be disputed, that that was new, until Mr. Hodge was called, and Mr. Hodge's evidence goes to prove that none of it is new, because Mr. Hodge proves, that in 1829, he had a lathe down in Cornwall, which lathe had a step to hold a journal, made of brass, which was first tinned, into which soft metal was then run, and which was retained in its position by fillets. And he says, also, that he made another,—an experimental fir cutting machine, in London, also, I think, about 1829, in which certain grooves were introduced; but it does not appear there were any fillets in that to retain the soft metal that was run into the grooves in that position. Perhaps, therefore, we may lay that out of consideration. Then, he says, in 1829, he made that lathe, and he used it for a time, then carried it to London, and there used it for a time, and then sold it. What became of it we do not afterwards hear. It does not appear that any attempt has been made to trace it from 1829, for I think he went abroad, to America, in 1829, down to the present time. We do not hear of it whether it was a mere experiment, whether anybody else took notice of it so as to know anything about it, or what became of it you do not hear; it is not at all explained to you,—and although a person may have hit upon a particular thing, and tried an experiment with reference to it, yet, if that afterwards is laid by and abandoned, so that the public never gets the use of it, the person who afterwards invents, and brings it into notice and use, may still have a patent for it; and I think Mr. Hodge's evidence was only evidence which went to negative the novelty for which

the patent was granted, and upon this issue I think you are to consider the whole combination for which the patent was granted. Therefore that leaves for consideration the main question in the cause—Have the defendants pirated, that is, used any portion of that patent which has been granted to the plaintiff?

Now if a patent is granted for a new combination of several things that have been known before, and he gets the patent for the whole thing so perfected, that does not prevent any one from using those parts which were known before. A combination of machinery for a particular purpose may be known, and in use up to a certain extent. An addition may be made to that which is quite new, and then the party may take out a patent for the whole machine, composed of the old part and these new parts; but such a patent would not prevent a person from using the old parts afterwards. It does not seem there is any evidence that the defendants have used the whole combination; that is, they have not used the steps with the fillets for the purpose of retaining in them the soft metal when run in in a state of fusion.

Then let us see what the evidence is as to the extent to which they have used anything. I think we must take it upon the evidence now, that they have taken new brasses for steps and bearings of their axles,—new ones, and that they have first of all cleaned them and tinned them in the ordinary way by washing them with tin; that they have afterwards heated those brasses, and then, by means of a stick of tin, succeeded in laying on to them tin to the thickness of somewhere between a sixteenth and an eighth of an inch. That was the description given by the witnesses yesterday, and as they vouched the Company's servants for knowing that, and having done that, and as you have no evidence to contradict it in the slightest degree, and the Company might have brought those servants here if they could have contradicted it, I think you may fairly take it to be true to the extent to which those witnesses stated it to you,—you may fairly assume there was no exaggeration or mistake in the evidence which they gave.

With respect to there being new brasses, and not merely patching of the old, certainly one of the witnesses spoke distinctly to two engines which had had the new brasses applied, prepared in this manner by people whom he named, and those people might have been brought here by this morning, if the Company had had it in their power, by them, to contradict what was sworn. Therefore they cannot be taken by surprise on that subject. The Court broke up a long time before the mail train leaves in the evening,—they might have been back here in very good time to give evidence before you.

The question then would come to this,—whether that is an adoption substantially of any portion of that for which the plaintiff obtained his patent, and whether that portion of the patent right is new; therefore it will be, whether they have by that process of washing with tin, and afterwards rubbing the tin on, and if necessary smoothing it with a soldering iron, obtained that benefit which the evidence shews results from the plaintiffs' patent. Although they may not have obtained it to the same extent, or nearly to the same extent, yet if they have obtained some portion of the benefit, they are responsible; if as to that portion they could not prove that it was in use before the patent was granted.

Now that brings us to a consideration of the evidence in the cause. Now the first witness was Mr. Fothergill, foreman to Messrs. Sharpe, Brothers, and Company, who has been in their employ twenty-one

years in all, and he represents them,—possibly you may have the means of knowing whether he represents the truth or not,—that they are persons very eminent in their line, and very extensively employed in the manufacture of locomotive engines and other machinery; and he describes this as perfectly knew to him. He says, it was not used in their manufactory, that it was very essential to discover some mode of diminishing the abrasion and heat of these boxes, and that in their manufactory they knew nothing of this sort till the plaintiff's invention came out. He says, he first heard of it in 1843, and he describes the extent to which the working of the engines, without repair, has been increased since that was introduced. There can be not the least doubt about its utility,—no doubt about that. Then he is cross-examined about the introduction of tin into bearings, and he says, I have known tin introduced into bearings in cases of expediency; he said, I mean where the bearings of the shaft had been much worn, and it has been necessary to repair it during the night, because we had to work again in the morning, and it has been found the shaft could not be got out to put a new brass in by the morning,—the workmen have lifted the shaft, poured in some melted block tin or lead, and let that be under the shaft so as to make a new bed for it; and that has remained in use till we have had the opportunity of substituting a new brass. Well, then he says, sometimes, when they have not fitted well, that we have used solid block tin steps, and those did not answer. It appears they were sent over to Ireland,—some half dozen. One witness proves he saw them in operation, and, I think, superintended them,—they did not answer. You cannot say a block tin step is the same thing as a tinned step,—you will have no difficulty probably about that.

Then Mr. Fairbairn, an engineer at Manchester, also tells you that this was to him perfectly new, that he never had seen it in use before, that he had never used it; but that he had used block tin steps and alloys of tin, but they were always solid. Never merely a coating of that material within the hard brasses or metal steps. He says, I think the novelty consists in having the outer case of a hard metal, and running in the alloy as a lining, and applying it in locomotives, to the journals of axles and shafts. He says, I have known before alloy would prevent heat in revolving substances, but he certainly never knew of any such application as that which is mentioned in the patent. Then Mr. Robert Stephenson, a gentleman very well known, and very largely concerned in all branches of engineering, and very well acquainted, particularly, with locomotive engines, says, that he has seen it, and he thinks, that if the lining were thin, the extension by pressure would not take place, and he says, I consider fillets useful when the thickness of tin is considerable, and the thickness of tin is important, because it makes them last longer.

Then Mr. Wilkinson, who is the foreman at Bolton and Watt's, says he has been forty-three years in their service, fitting up engines and so forth, and to him the lining of steps and bearings with tin or an alloy of tin, is quite new.

Then Mr. John Jones, who is the managing partner of the Viaduct Foundry, gives you evidence to the same effect.

Then Mr. John Hicks, the proprietor of the Soho Works, at Bolton-le-Moors, says, he is acquainted with linings of soft metal to bearings, that he never knew it till a year and a half ago; he is now building engines upon that plan; he is working on the plan of the patentee.

Then Mr. Bennett Woodcroft, consulting engineer, of Manchester,

says, he does not know much about steps of locomotives, but a good deal about steps of other engines, and he never knew anything of this till the plaintiff's patent came out.

Then Mr. Glasgow, an engineer, of 35 years standing, in the House of Galloway Beaumont and Glasgow, manufacturers, says, that to him it was perfectly new, that tinning for the purpose of joining hard metal with soft, was to him new. He says, that the tinning is new, and running them together is new, but tinning them first for the purpose of soldering on other metal is not new, at least, to his knowledge.

Then we have Michael Allison, an important witness, the out-of-door foreman of the Liverpool and Manchester Railway Company, and he has been in their employment five years and a half; he speaks of the performance of this upon the three engines to which it was applied. That goes rather to the utility. I shall come back to his evidence with respect to the user of this by the company.

So also of Benjamin Lewis. Then we have Mr. Edward M'Connell, engineer to the Birmingham and Gloucester Railway Company. He says, that they have adopted the patent; and he is cross-examined to this to shew that he had known of such a user of the soft lining before; and Mr. M'Connell says, I remember in Garwood's manufactory at Glasgow, some brasses of a circular saw got heated, then we put in a tin lining that was washed on in the usual way. The mere washing of tin is not claimed in this case; the washing of tin probably would not be considered as an evasion of it. That, however, I shall leave to you, but it does not arise in the present case. Certainly, this evidence of Garwood's manufactory, I think, you will be of opinion, falls short of that which the Company have done in this respect.

Then we have Nicholas Adamson,—he was only an engine driver.

Then Mr. Benjamin Cubitt, who is very extensively engaged as an engineer, says, that he has not known of soft metal introduced into bearings by fusion; he says, I have been conversant with mills and engines for a good while: he was in Fenton and Murray's for nine years; and that was a very great house for machinery.

Then Mr. Archibald Sturrock, the manager of the works on the Great Western Railway, says, the patent lining is used there; that they never used it before; and Mr. Fearniheugh, who is superintendent of the locomotive department of the Eastern Counties Railway, says, they have introduced the patent, and he thinks it decidedly new, and he thinks the introduction of it with fillets is a great improvement, and that it would not answer well without it. He says, without that you could not make the soft metal thick enough to make it worth while to use it.

Then Mr. Melling, an engine builder at Ram Hill, tells you, that on the Grand Junction Railway in 1840, none of these tin linings had been introduced.

That is the evidence on the part of the plaintiff as to the novelty of this invention. All these eminent engineers tell you that the introduction of this soft metal lining for brasses or bearings was to them perfectly new until this came out. The only exception to that in their evidence, is the evidence of Mr. M'Connell, who says, that in a Glasgow manufactory the washing of tin was used to the brasses of a circular saw which got heated. In answer to that it is very remarkable that they do not call any one engineer or engine maker, except Mr. Hodge—not one. They call Mr. Radcliffe, who is an artizan, who is employed by Messrs. Bower and Co., of Nantwich, cotton spinners, to superin-

tend their machinery and repair it, and he tells you that "when our brasses had worn away, I frequently repaired them by pouring in melted tin in order to fill up the space, so as to make them fit again,"—he patched the brasses in that way.

Now, Joseph Heskith, in the employ of the defendants at Crewe, is an engineer. He tells you he was formerly in the employ of Messrs. Bower, of Nantwich, as assistant in repairing these machines, and he tells you he had assisted the first witness Radcliffe, in repairing the brasses in the manner he described.

Then comes a witness of the name of Parkinson, and he tells you, when he was a boy of about 15 or 16 years old, his father worked at Parkinson's at Bury, and he worked there, and he said that they had journals of different sizes to use, and that the brasses were only of two or three sizes, and when they wanted to introduce a journal that did not fit the brasses, they then poured in liquid tin for the purpose of making it fit; and he described the manner in which that was done,—that it was done by introducing a sort of sand mandril; he said the mandril was made of sand; it must have been some adhesive matter to make it stick together; then the whole thing was put into a mould of sand, and the tin was run in. You recollect he described that very minutely. He was then cross-examined a good deal about what he has been doing, and the places he has been to since, and about his having taken a very active part to get witnesses in this cause. It did appear he had been employed in that capacity, and gone about obtaining information and getting witnesses.

Then we have Thomas Barlow, an older person, who was in the employ of Parkinson, who saw the brasses repaired by soldering on the tin, but although he was in the manufactory at that time, he never saw any made in the manner that the former witness had described.

Then William Mason, a tin plate worker at Manchester, now at Marsh and Shears', and who was formerly a tin plate worker, who has employed himself in making pots and tins at Oldham, was there for some four or five years. He said, the people from the mills brought him the brasses when they wanted them repaired, and got him to solder some tin on; I did it. He described the mode of repairing the brasses for them when they were worn away.

Then James Wilde, in the employ of Messrs. Broadbent, cotton spinners, at Oldham, says, they had used steps lined with tin six or seven years; they got them repaired in this way, and it was the man Mason who repaired them; therefore that leaves the case just as it was upon Mason's evidence.

Then you have Joseph Clarke, who was in the employ of the Manchester and Leeds Railway Company. He proves that in 1824, 21 years ago, he bought different parts of a lathe, and because the brasses were too wide and would not fit the journals, he says, I got them at different places and put them together; he melted in some soft metal in order to fill up the spaces. It appears he used that in his own room for a considerable time for his own improvement; he says, he sold it in 1841. Some of his comrades saw the lathe.

Then we have the evidence of Mr. Hodge; he tells you of his having first made that fir cutting machine in 1829, some experimental bearings,—that does appear to have been an experiment,—then the brasses were cut in longitudinal grooves and some soft metal run into it,—block tin. Then he spoke to having made that other in Cornwall, and then he tells you this, that in 1829, down in Cornwall, the lathes for

turning iron in different manufactories were commonly made with brasses of this description—with brasses lined with softer metal, as described. That is in 1829. Mr. Hodge then went to America, and has remained there until within six or seven months, with the exception of a trip to England in the autumn of 1843. Now if they were in common use in Cornwall at that time, though not known to any of the eminent engineers in this part of the country, they were not new when this patent was taken out. Whether Mr. Hodge accurately recollects what was going on in Cornwall,—whether you think he may be somewhat mistaken about it, speaking from his recollection of so long a time ago,—whether you think that is more probable than that such brasses so prepared for the purpose of preventing friction, which, he says, was the case, was not known to any of the eminent engineers who have been called from different parts of the kingdom; whether it is more probable he was mistaken in his memory than that all the other gentlemen should have remained ignorant of the fact,—is for your consideration, but certainly he does describe brasses prepared and lined according to that mode, very much according to the principle for which this patent was granted, if Mr. Hodge is correct. Then, if you think Mr. Hodge is correct, and these things wese used at that time in Cornwall, then undoubtedly the plaintiff's patent must fail; or if you think this patching of brasses spoken to by these people who have been employed as artizans in repairing the machinery of mills, though not in making,—if you think that that is substantially the same thing as that which the plaintiff has made independent of the fillets, then indeed the defendants would not have been guilty of violating that part of the patent, because, as I said before, the whole patent consists of the fillets, and of this metal run and fused into the brasses. The fillet has not been pirated. What has been pirated is the lining with tin, not by putting it on in a state of fusion, but by rubbing it on with a stick when the brass is hot; therefore only a partial fusion takes place when it adhered. Still, however it was applied, if it was new in substance and effect it would be an evasion of the plaintiff's patent. But if you think the patching in the manner in which it has been applied in repairing old steps was substantially the same thing as lining new ones, then the plaintiff could not say that the defendants had pirated that part of his patent, because then it would be no piracy to use that which had been known before.

With this direction you will be pleased to say whether you find those other issues;—the two issues upon which you will have to decide, will be, whether this was a new manufacture, taking it with the fillets altogether? If it was new, then the plaintiff will be entitled to a verdict upon that issue. Then, if it was new, whether you think that part used by the defendants according to the evidence, namely, the washing it with tin and putting upon it the other tin in the manner described, whether that is substantially the same thing as the patching before or not; because, if it was the same thing as the evidence of the parties, patching of the old machinery, then there would be an end of the case on that ground, because there would be no piracy. If, on the other hand, you think it was not the same thing, and the whole patent was new, then this would be a piracy of a part, and the plaintiff would be entitled to your verdict.

Then, as to the damages they are to have, it is difficult to make out to what extent that has gone. It appears, some time ago, I think

about six months after the patent was first taken out in 1843, they begun to tin some of their brasses,—that has gone on by degrees progressing down to the present time, and as they have the account of that and have not shewn to what extent they have used this, whether it be an infringement of the patent or not, you must make the best guess you can as to the compensation they ought to make to the plaintiff for violating his patent.

At 27 minutes past 12, the jury considered of their verdict.

The Foreman.—My Lord we wish to retire,

At half-past 12 the jury retired,—at 9 minutes past 1 the jury came into Court.

The Associate.—Gentlemen are you agreed upon your verdict?

The Foreman.—We are.

The Associate.—Do you find for the plaintiff or for the defendants?

The Foreman.—Verdict for the plaintiff.

The Associate.—What damages?

The Foreman.—Damages £1000.

Mr. Martin.—Will your Lordship certify under the Statute of the 5th and 6th William the Fourth?

Mr. Justice Cresswell.—Yes.

Mr. Martin.—As it is our special jury, your Lordship will also certify for a special jury.

Mr. Justice Cresswell.—Yes.

LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

1845.

Aug. 28. *Thomas Masters*, of 56, Upper Charlotte-street, Fitzroy-square, for a machine for cleansing forks.

29. *John Paterson*, of 104, Wood-street, Cheapside, London, for a cravat collar.

29. *James Wilson*, of 37, Walbrook, London, for an apparatus for shaping and stretching hats.

29. *Edward Highton*, of Cardiff, South Wales, for a railway chair.

Sept. 3. *William Wadman*, of Bristol, for a flat flame shadowless gas lamp.

3. *William Hutton & Son*, of Sheffield, for a pen-holder.

3. *Brookes Hugh Bullock*, of 2, Chester-street, Grosvenor-place, Middlesex, for a distance measurer, for maps, charts, &c.

3. *Francis Higginson*, of St. Margaret's Bank, Rochester, County of Kent, for an apparatus for extinguishing accidental fires in dwelling houses, and other buildings.

Sept. 6. *W. C. Wilkins & M. S. Kendrick*, of Long Acre, for an improved spirit lamp.

12. *Simon King*, of Upper Thorpe, Sheffield, Yorkshire, for a ventilating and smoke consuming stove grate.

12. *George and John Deane*, of 46, King William-street, London Bridge, for the "Stulos" coffee pot.

13. *Joseph Guibert*, of 59, Hatton Garden, for a clip or holder for holding invoices, music, letters, and other papers.

23. *Thomas Jones*, of Holly Lodge, Hanwell, for an expanding and collapsing box or packing case.

24. *Andrew Bisset & James Woodclarke*, of 1, Rodney-buildings, New Kent-road, for the Bachelor's oven.

25. *Charles Lewis*, of Stangate House, Lambeth, for an improved omni-directive shower bath.

List of Patents

Granted for SCOTLAND, subsequent to August 22nd, 1845.

To George Myers, of Laurie-terrace, Westminster-road, Lambeth, London, builder, for improvements in cutting or carving wood, stone, and other materials.—Sealed 27th August.

Jacob Brett, of Hanover-square, London, for improvements in printing communications made by electric telegraphs,—being a communication.—Sealed 27th August.

Joseph Zambaux, chemist, of Paris, for improvements in atmospheric railways.—Sealed 8th September.

John and George Cox, of Gorgie Mills, county of Edinburgh, tanners and glue-makers, for improvements in tanning and leather dressing.—Sealed 8th September.

Hypolite Louis François Salembier, of Mincing-lane, London, merchant, for improvements in the manufacture and refining of sugar,—being a communication.—Sealed 8th September.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, London, civil engineer, for improvements in machinery or apparatus for spinning,—being a communication.—Sealed 8th September.

William Wylam, of Gateshead, Durham, for certain improvements in artificial fuel, and in machinery for manufacturing the same.—Sealed 16th September.

John Russell, of the city of Edinburgh, accountant, for a manufacture of glass tiles.—Sealed 16th September.

Edwin Hill, of Bruce Castle, in the county of Middlesex, and Warren de la Rue, of Bunhill-row, Middlesex, manufacturer, for improvements in the manufacture of envelopes.—Sealed 16th September.

Jacob Bretts, of Hanover-square, London, for improvements in atmospheric propulsion, and in the manufacture of tubes for atmospheric railways, and other purposes,—being a communication.—Sealed 16th September.

James Hardcastle, of Firwood, Bolton-le-moors, in the county of Lancaster, for certain improvements in the method of conveying water.—Sealed 22nd September.

New Patents
SEALED IN ENGLAND.
1845.

To Alfred Vincent Newton, of the Office for Patents, 66, Chancery-lane, mechanical draughtsman, for certain improvements in machinery for manufacturing India-rubber fabrics,—being a communication. Sealed 28th August—6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, civil engineer, for improvements in machinery or apparatus for spinning,—being a communication. Sealed 28th Aug. —6 months for inrolment.

Mathieu François Isoard, of Paris, for improvements in obtaining motive power. Sealed 28th August—6 months for inrolment.

John Vaux, of Frederick-street, Gray's-inn-road, Gent., for improvements in apparatus for warming boots and shoes. Sealed 4th September—6 months for inrolment.

Henry Samuel Rayner, of Ripley, in the county of Derby, Gent., for certain improvements in locomotive engines. Sealed 4th September—6 months for inrolment

Henry Bewley, of Dublin, chemist, for certain improvements in flexible syringes, tubes, bottles, hose, and other like vehicles and vessels. Sealed 4th September—6 months for inrolment.

Charles Lampitt, of Banbury, engineer, for an improved dibbling machine. Sealed 4th September—6 months for inrolment.

Alexander Haig, of No. 45, Great Carlisle-street, Portman market, engineer, for certain improvements in machinery for ventilation and other similar purposes to which the said machinery can be applied. Sealed 4th September—6 months for inrolment.

Elisha Haydon Collier, of Goldsworthy-terrace, Rotherhithe, engineer, for certain improvements in the manufacture of nails, and in the machinery or apparatus to be used for such purposes. Sealed 11th September—6 months for inrolment.

Henry Mandeville Meade, of the city of New York, America, for improvements in distilling from Indian corn and other grain. Sealed 18th September—6 months for inrolment.

Joseph François Laubereau, of Paris, Gent., for improvements in obtaining power. Sealed 18th September—6 months for inrolment.

Charles Hodgson Horsfall, of Liverpool, merchant, for improvements in the manufacture of iron. Sealed 18th September—6 months for inrolment.

William Eccles, of Blackburn, power-loom manufacturer; William Cook, of Livesey, hand-loom weaver; and William Lancaster, power-loom weaver, of Blackburn, all in the county of Lancaster, for certain improvements in looms for weaving. Sealed 18th September—6 months for inrolment.

Charles Murland, of Castlewellan, Ireland, flax spinner, and Edward Lawson, of Leeds, machine-maker, for certain improvements in machinery for preparing and spinning flax and other fibrous substances. Sealed 18th September—6 months for inrolment.

James Polkinghorne, the younger, of Hoxton, Gent., for certain improvements in treating ores, and in separating from them the metals which they contain. Sealed 18th September—6 months for inrolment.

James Caldwell, of Broad-street, Radcliff, engineer, for improvements in ships' riding bits, and in windlasses. Sealed 18th September—6 months for inrolment.

Stephen Higginson Perkins, of Charlotte-street, Bedford-square, for certain improvements in the steam-engine, and its application to steam navigation,—being a communication. Sealed 18th September—6 months for inrolment.

Edward Chrimes, of Rotherham, brass-founder, for improvements in cocks and taps. Sealed 25th September—5 months for inrolment.

CELESTIAL PHENOMENA FOR OCTOBER, 1845.

D.	H.	M.	
1			Clock after the sun, 10m. 21s.
—			☽ rises 6h. 5m. M.
—			☽ passes mer. 11h. 46m. M.
—			☽ sets 5h. 17m. A.
	3	2	♅ in oppo. to the ☉
	8	32	♃'s third sat. will im.
	10	41	♃'s third sat. will em.
	10	59	Ecliptic conj. or ● new moon
2	12	59	Juno in conj. with the ☉
3	15	20	♃'s first sat. will im.
3	20	25	♀ in conj. with the ☽ diff. of dec. 0. 59. S.
5	9	48	♃'s first sat. will im.
7	5	9	☿ greatest hel. lat. N.
8			Occul. A.S.C. 2270, im. 5h. 22m. em. 6h. 22m.
8	5		☽ in Perigee
8	11	31	☽ in □ or first quarter
	12	33	♃'s third sat. will im.
9	9	46	♃'s second sat. will im.
10			Clock after the sun, 12m. 58s.
—			☽ rises 2h. 50m. A.
—			☽ passes mer. 8h. 0m. M.
—			☽ sets 0h. 3m. M.
		47	♄ in conj. with the ☽ diff. of dec. 6. 36. S.
	17	14	♃'s first sat. will im.
	22	57	♂ in conj. with the ☽ diff. of dec. 9. 12. S.
12	11	43	♃'s first sat. will im.
12	17	28	♂ in conj. with Ceres, diff. of dec. 10. 24. S.
	18	43	Vesta stationary
13	23	43	♅ in conj. with the ☽ diff. of dec 4. 15. S.
15			Ceres stationary
	9	56	Ecliptic oppo. or ○ full moon
	16	23	♃'s third sat. will im.
	17	9	☿ in conj. with Juno, diff. of dec. 2. 12. S.
			Clock after the sun, 14m. 10s.
—			☽ rises 4h. 59m. A.
—			☽ passes mer. Morn.
—			☽ sets 6h. 24m. M.
16			Mercury R. A. 13h. 0m. dec. 4. 49. S.
—			Venus R. A. 15h. 58m. dec. 22. 6. S.
—			Mars R. A. 21h. 56m. dec. 15. 56. S.
—			Vesta R. A. 5h. 8m. dec. 16. 0. N.

D.	H.	M.	
—			Juno R. A. 12h. 59m. dec. 2. 26. S.
—			Pallas R. A. 19h. 52m. dec. 2. 29. N.
—			Ceres R. A. 21h. 52m. dec. 26. 43. S.
—			Jupiter R. A. 2h. 22m. dec. 12. 37. N.
—			Saturn R. A. 21h. 0m. dec. 18. 11. S.
—			Georg. R. A. 0h. 29m. dec. 2. 22. N.
—			Mercury passes mer. 23h. 23m.
—			Venus passes mer. 2h. 18m.
—			Mars passes mer. 8h. 16m.
—			Jupiter passes mer. 12h. 40m.
—			Saturn passes mer. 7h. 19m.
—			Georg. passes mer. 10h. 48m.
16	3	43	♃ in conj. with the ☽ diff. of dec. 2. 22. S.
	12	22	♃'s second sat. will im.
	13	45	♄ stationary
18			Occul. ε in Tauri, im. 7h. 49m. em. 8h. 43m.
19	13	37	♃'s first sat. will im.
20			Clock after the sun, 15m. 8s.
—			☽ rises 8h. 19m. A.
—			☽ passes mer. 3h. 31m. M.
—			☽ sets 11h. 34m. M.
			Occul. *E*2 Orionis im. 9h. 15m. em. 10h. 6m.
21	1	33	♀ in Aphelion
	8	6	♃'s first sat. will im.
22	2		☽ in Apogee
23	8	14	☽ in □ or last quarter
	14	59	♃'s second sat. will im.
24	18	45	Pallas in □ with the ☉
25			Clock after the ☉ 15m. 50s.
—			☽ rises 0h. 21m. M.
—			☽ passes mer. 7h. 22m. M.
—			☽ sets 2h. 11m. A.
26	8	5	☿ in sup. conj. with the ☉
	15	32	♃'s first sat. will im.
28	19	25	♃ in oppo. to the ☉
30			☉ eclipsed, invisible at Greenwich
	6	37	♃'s first sat. will im.
	11	42	Ecliptic conj. or ● new moon
	17	6	☿ in conj. with the ☽ diff. of dec. 0. 35. N.
		35	☿ in the descending node

J. LEWTHWAITE, Rotherhithe.

THE

LONDON JOURNAL,

AND

REPERTORY

OF

Arts, Sciences, and Manufactures.

CONJOINED SERIES.

No. CLXVII.

RECENT PATENTS.

To William Kenworthy, *of Blackburn, in the county of Lancaster, cotton-spinner, for his invention of certain improvements in looms for weaving.*—[Sealed 12th December, 1844.]

These improvements in looms for weaving apply solely to such as are worked by power, and particularly to that part of the power-loom known by the name of the "stop-rod," which is for stopping the loom, or throwing it out of gear with the driving-power, whenever the shuttle does not complete its course from one shuttle-box to the other. In ordinary power-looms this is effected by the shuttle acting against a "swell" in the shuttle-box, which communicates the required motion to the stop-rod, by means of a lever, bearing against the swell, and kept in contact with it by a spring. The great objection to this arrangement is, that the shuttle has to overcome the resistance of the spring, and also to raise the weight of the stop-rod lever at every "pick" or throw of the loom, which requires to have a heavy shuttle, a powerful pick, and a slow motion, to work successfully.

The present invention consists in working the stop-rod motion entirely separate from the shuttle by the motion of the slay or lathe alone, thereby relieving the shuttle from the

burden of lifting the stop-rod lever at every pick. By this improvement the patentee states, that he is enabled to drive power-looms at twenty or twenty-five per cent. faster than has been hitherto done, and with much greater safety to the working parts.

In Plate X., two methods are shewn by which the required object, namely, working the stop-rod motion independent of the shuttle, may be effected. Fig. 1, represents a plan or horizontal view of the shuttle-box, and part of the slay of a power-loom for weaving, shewing one of the improved arrangements; fig. 2, is a side view of the same; and fig. 3, is a side view of a different arrangement of mechanism, intended to effect the same object. *a, a,* is the end or main framing of the loom; *b, b,* part of the breast-beam; *c, c,* part of the slay or batten; *d, d,* the shuttle-box; and *e, e,* is the swell, which is acted upon by the spring *f, f,* and which is merely for the purpose of keeping the shuttle in its place in the box, and preventing its rebounding, by bearing against its side. The stop-rod or shaft *g, g,* is connected to and works the spring-lever (for shifting the driving-strap), which is on the other side of the loom, and not shewn in the drawings; on this shaft the stop-piece *h,* is keyed fast, which is furnished with a projecting tail-piece *i,* bearing upon a roller or bowl *k,* which revolves loosely upon a pin or stud *l*; *m, m,* is a lever or finger which, at every throw or pick of the loom, feels (as it were) whether the shuttle has arrived in the box or not: the shaft *g,* is furnished with two of these fingers *m, m,* one acting upon each shuttle-box.

The operation of the apparatus is as follows:—As soon as the batten or slay *c, c,* (in beating up) arrives directly over its centre, the shuttle *n,* is driven out of the shuttle-box *d,* across the loom; at the same time, or nearly so, the inclined portion of the tail *i,* of the stop-piece *h,* will have arrived over the bowl or roller *k,* which will allow the spring *o, o,* to exert its power to bring down the stop-piece *h*; at the same time causing the fingers *m, m,* at each end of the stop-rod *g,* to feel whether the shuttle is in either box; and if such be the case, the swell, bearing against the finger *m,* will not allow the spring *o,* to bring down the stop-piece *h*; but should the shuttle be absent from both boxes, the stop-piece *h,* will be

brought down, and, by striking against the "frog" *p*, prevent the slay from beating up any further and injuring the cloth, at the same time that the stop-rod *g*, *g*, throws off the driving-strap and stops the loom.

In fig. 3, the action of the swell *e*, *e*, the finger *m*, and the stop-piece *h*, is precisely the same as in figs. 1, and 2,—the spring *o*, being placed behind the stop-rod *g*, and, consequently, always having a tendency to raise the stop-piece *h*, which is prevented from rising higher than is necessary to clear the frog *p*, by the stop *q*, fixed to the shuttle-box. It will be seen, that the stop-rod *g*, is, in this instance, furnished with a lever *r*, which, as soon as the shuttle has been driven across the loom, comes in contact with the lever *s*, vibrating upon its centre at *t*; this lever is connected to a spring *u*, which causes the fingers *m*, to try whether the shuttle is in the box or not. If the shuttle is in either of the boxes, the spring *u*, will give way; but if the shuttle is in the race, the spring *u*, being stronger than the spring *o*, will bring down the stop-piece *h*, and throw the driving-strap upon the loose pulley. *v*, is a stop-pin, for the purpose of preventing the spring *u*, from drawing the lever *s*, further than the perpendicular line above its centre.

Another modification of this invention may be made, by reversing the arrangement shewn in figs. 1, and 2, that is, by placing the bowl or roller *k*, upon the stop-piece *h*, and the inclined plane upon the frog or framing of the loom; but the patentee prefers either of the former arrangements, as the additional weight of the roller upon the stop-rod would cause a great strain upon it, and require additional power.

The patentee claims the novel and peculiar construction and arrangement of mechanism or apparatus (or any modification of the same), and the particular application thereof to power-looms, for the purpose above described, and in the manner represented in the drawing; that is, working or performing the stop-rod motion entirely separate or distinct from the action of the shuttle, and effecting the same by the vibration of the slay or batten.—[*Inrolled in the Petty Bag Office, June*, 1845.]

Specification drawn by Messrs. Newton and Son.

To John Sellers, Jun., *of Burnley, in the county of Lancaster, cotton-spinner, for his invention of certain improvements in looms for weaving.*—[Sealed 17th March, 1845.]

These improvements consist in a novel arrangement of mechanism designed for the purpose of instantly stopping the whole of the working parts of a power-loom, whenever the shuttle stops in the shed; that is to say, whenever it does not complete its course from one shuttle-box to the other. In ordinary power-looms this object is effected in the following manner:—Each shuttle-box is provided with what is called a "swell" (which projects from the outside of the shuttle-box when the shuttle is in the box), against which a small lever, fixed upon the "stop-rod," bears. Upon the stop-rod is also fixed another small lever or finger, which, when the shuttle is not in either box (and consequently the swell does not project), falls down, and comes in contact with a stop-piece called "the frog," attached to the framing. The lathe or slay is thus prevented from beating up any further and injuring the cloth; and at the same time a small apparatus, fixed to the slay, strikes against the "spring-handle" of the loom, and causes it to shift the driving-strap from the fast pulley on to the loose one, and thus stop the action of the loom.

The principal defect in this arrangement, and which the present invention is intended to obviate, is the frequent breakage of the different parts of the loom, occasioned by the shock of the lathe or slay striking against the frog (which is fixed to the framing), especially if the loom is working rather fast. In the improved arrangement, the swell and the stop-rod finger are employed as usual, but the construction of the latter is somewhat modified, it being in one piece with the small lever, which bears against the swell; and instead of its striking against a stop or frog, fixed to the framing of the loom, it strikes against a stop or notch upon the upper end of a vertical lever, vibrating upon a pin or stud. This lever is furnished with a small roller or bowl, which acts against a projection on a horizontal lever, causing it to vibrate upon its

centre, and throw a clutch-box (which connects the main driving-pulley to the driving-shaft) out of gear, and allows the main driving-pulley to revolve loosely upon the driving-shaft, at the same time that a projection on the lever strikes against the spring-handle, and shifts the strap. Simultaneously with these two movements, the lower end of the vertical lever causes a break to be brought in contact with the fly-wheel of the loom, thus instantaneously stopping every motion of the loom, without the slightest shock, at whatever speed the loom may be working.

In Plate X., fig. 1, represents, in plan view, part of a power-loom, with the improvements applied thereto; and fig. 2, is a side or end view of the same. *a, a,* is the main or side framing of the loom; *b,* is the yarn-roller or beam; *c,* the crank-shaft; *d,* one of the shuttle-boxes; *e,* the breast-beam; and *f,* the roller. Upon the crank-shaft *c,* the pulleys *g,* and *h,* are mounted, as usual, except that the pulley *g,* which, in ordinary power-looms, is keyed fast upon the crank-shaft, is, in this instance, placed loose upon the same, and is connected with it by means of a clutch-box, one half of which *i,* is cast on to the pulley *g,* and the other half *k,* slides upon a feather or key *e,* upon the crank-shaft *c.* This clutch-box is thrown out of gear in the following manner, for the purpose of stopping the loom:—Upon the stop-rod *m,* (see fig. 2,) are fixed the stop-rod fingers *n,* (of which only one is shewn in the drawing; the other being at the further end of the loom). Whenever the shuttle stops in the shed, at which time neither swell projects, the fingers *n,* fall down and come in contact with a stop or notch *o,* at the upper end of the vertical lever *p.* This lever *p,* is mounted upon a pin or stud at *q,* and is furnished with a small roller or bowl *r,* which, acting against the projection upon the end of the lever *s,* will cause that lever to vibrate upon its centre, and draw the clutch *i,* out of contact with the clutch *k*; thus allowing the pulley *g,* to revolve loosely upon the crank-shaft. At the same time the projection *t,* at the top of the lever *p,* will strike against the spring-handle and shift the driving-strap on to the loose pulley *h,* as usual. Simultaneously with these movements, the break *u,* is brought into contact with

the fly-wheel *v*, in consequence of its being fixed to the bell-crank lever *w*, mounted upon a fulcrum at *x*; the lower end of which lever is connected to the lever *p*, by the link *y*.—*z*, is a spring, for the purpose of keeping the two halves *i*, and *k*, of the clutch-box in gear, except when thrown out as above described.

The patentee claims the above-described novel arrangement of mechanism for stopping the loom, whenever the shuttle does not complete its course from one shuttle-box to the other, by disconnecting the main driving-pulley from the driving-shaft; and also the method of bringing a break into connection with the fly-wheel, for the purpose of preventing the lathe or slay from beating up any further and injuring the cloth, by the shuttle stopping in the shed, or between the warp-threads.—[*Inrolled in the Petty Bag Office, September*, 1845.]

Specification drawn by Messrs. Newton and Son.

To CHRISTOPHER NICKELS, *of York-road, Lambeth, in the county of Surrey, Gent., for improvements in the manufacture of elastic webs and cords, and in the mode or modes of manufacturing articles from the same.*—[Sealed 13th March, 1845.]

THIS invention is divided into three parts: the first part consists in employing India-rubber weft threads in the manufacture of narrow elastic bands and cords.

In weaving elastic webs, the patentee prefers that the India-rubber strands, to be used as weft, should not be covered; that the webs should be of tabby or broken twill weaving (the warp threads being of cotton, silk, worsted, or other fibrous materials); and that the warp of the selvages or edges should be suitably arranged for making round or corded selvages, so that the India-rubber weft may be covered by the warp at the edges, as well as at the other parts of the weaving. The patentee states that webs, made in this manner, will be found to possess very peculiar elastic properties; for, in addition to the lateral elasticity, consequent upon the India-

rubber being transversely of the fabric, there will be considerable longitudinal elasticity; and in drawing out a portion of such web longitudinally, it will be found that the web widens as it is elongated, which is a character possessed by no other narrow elastic webbing. In order that the web may be flat and not liable to curl, the warp, which is composed of cotton, silk, or other fibrous materials, is alternately thrown or twisted in opposite directions. If required, India-rubber threads, covered or uncovered, may be introduced as part of the warp, in the usual way; by which means, a compound web can be produced, having India-rubber threads running longitudinally as well as transversely. These narrow elastic webs may be employed for making braces, garters, girths, rollers, bands, and for other purposes.

In weaving cords with India-rubber weft, the warps are to be opened in a suitable manner for producing a close tubular weaving, as in weaving the common roller-blind or union cord; if preferred, a central cord of India-rubber may be introduced.

The India-rubber weft threads, both for webs and cords, are used in the non-elastic state, and afterwards rendered elastic by the application of heat.

The second part of this invention consists in manufacturing elastic webs, either wide or narrow, by combining a mode of cross weaving with India-rubber warp threads.

The mounting of the harness of a loom suitably for cross weaving being well understood, it will only be necessary to describe the motions employed in this mode of cross weaving. The warps of silk, cotton, or other fibrous material, and the India-rubber warps, are wound upon separate beams, at the back of the loom; the warps of fibrous material are divided, and pass through a pair of heddles, and then through half leaves and standards, in the ordinary manner; the India-rubber warps are supported by a frame, and also pass through heddles, so that they may be raised and lowered as required. The motions employed in this mode of cross weaving are represented at figs. 1, 2, 3, and 4, in Plate XII. *a*, *b*, being the upper and lower half leaves; *c*, *d*, their standards; *e*, the

India-rubber threads; and *f*, the ordinary warp threads. The different motions are as follows:—At fig. 1, the shed has been opened by the ordinary heddles, and the India-rubber warps are raised, so that the shuttle may pass under them; the shuttle then passes through the shed; the batten beats up the work, and the movement shewn at fig. 2, takes place, when the India-rubber threads descend, in order that the shuttle may pass over them; after the shuttle has passed through the shed, the batten beats up, and the movement represented at fig. 3, takes place, when the ordinary heddles cease to act, and the shed is opened by the half leaves and standards, and the India-rubber threads are raised, for the shuttle to pass under them; the shuttle then passes through, the batten beats up, and the movement shewn at fig. 4, takes place, when the India-rubber threads descend; after which, the shuttle passes through, the batten beats up, and the parts are again brought into the position for the movement fig. 1. In the fabric produced by these operations, the weft will be alternately on the upper and under sides of the India-rubber threads, and the warp of cotton or other fibrous material will not proceed in straight lines, but will be drawn across the India-rubber warps, forming a covering thereto;—a portion of the fabric, considerably magnified, is represented at fig. 5. If desired, India-rubber threads, forming part of the warp, may be arranged so as to lie longitudinally between those enclosed within the crossings of the ordinary warps, and to be passed alternately over and under by the weft only. The India-rubber threads are preferred to be employed uncovered; and that the other parts of the warp should cover them in the act of weaving: they are used in the non-elastic state, and afterwards rendered elastic by heat.

The third part of this invention has for its object the introduction of covered or uncovered India-rubber threads as weft, wherever it may be necessary, in cross weaving generally. When covered India-rubber thread is to be used as weft, it is placed in a shuttle, which is substituted for the shuttle containing the ordinary weft at those places where the elastic weft is to be introduced. If uncovered India-rubber thread is

employed, an extra harness is placed at the back, and is brought in while making the "sheath," as is well understood and adopted in the ordinary mode of covering the shoot.

The patentee does not claim the use of India-rubber as weft generally in fabrics; but he claims, Firstly,—the weaving of narrow elastic webs and cords when India-rubber is used as weft, as above described; also the weaving of narrow elastic webs where India-rubber thread is used as weft in combination with round corded or covered edges or selvages, as above described. Secondly,—the application of India-rubber threads or yarns in combination with a mode of cross weaving, as above described. Thirdly,—the application of India-rubber thread, either covered or uncovered, as weft in cross weaving generally, as above described.—[*Inrolled in the Inrolment Office, September,* 1845.]

To Louis Joseph Wallerand, *of Basing-lane, in the city of London, merchant, for an invention of improvements in dyeing or staining various kinds of fabrics,—being a communication.*—[Sealed 30th December, 1844.]

This invention consists in giving shaded stripes of color to woollen, silk, cotton, or other fabrics, by the employment of a peculiar arrangement of machinery, which produces the effect in a more expeditious, economic, and perfect manner, than by the ordinary hand-process. This machine may also be used for dyeing shaded stripes to form a ground upon fabrics intended afterwards to receive a printed pattern.

In Plate XI., are several views of the machinery by which the shaded stripes of color are given to the cloth or other fabric. Fig. 1, is a longitudinal elevation of the machine; fig. 2, is a plan or bird's-eye view; and fig. 3, is a transverse vertical section, taken in the line 1, 2, of fig. 2. A, is the wooden frame-work, which supports a vat C, containing the dyeing liquor; B, B, is a steam-pipe, running along the bottom of the vat, for heating the dyeing liquor; D, and D^1, are brackets, affixed at each end of the machine, and furnished

with slots, in which the axes of wooden rollers or cloth-beams J, and J^1, work; E, are a series of bars (made of either wood or metal), which serve as bearings for a series of wheels or rollers F; and G, are a similar series of bars, placed below the bars E, and are for the purpose of carrying the wheels or rollers F^1, which correspond in size and position with the rollers F. These bars, E, and G, rest upon cross-pieces at the ends of the vat C.

The drawing represents each pair of bars as carrying eight wheels only, but the number may be increased or diminished as may be thought necessary, according to the nature of the fabric to be dyed.

The upper and lower series of wheels or rollers F, and F^1, are made either of wood or metal, and are mounted loosely on their axles. H, is a roller, covered with felt or other material, and mounted in slotted bearings at the end of the dye-vat C: this roller is intended to take up the color from the vat, and to distribute it upon the surface of the cloth. I, is a lever or handle for raising the roller H, so that it may come in contact with the fabric. By this means, those parts of the fabric are dyed which would not otherwise have received any color. When a sufficient depth of color is thus obtained, the roller H, is depressed by means of the lever I, and thrown out of contact with the cloth. J, and J^1, are cloth-beams, upon which the fabric is wound before and after it is passed between the wheels F. K, and K^1, are wooden vessels at either end of the vat, for the reception of any portion of the dye which may fall from the fabric wound on the beams J, and J^1. L, is a pipe, furnished with a stop-cock, for the entrance of the steam into the pipe B; its escape is regulated by the pipe and cock M. N, N, are cog-wheels, mounted respectively on the axles of the cloth-beams J, and J^1, for the purpose of receiving motion from any convenient gearing, and conveying it to the cloth-beams; and O, are cross-pieces, serving to support the fabric while being passed through the machine.

In order to produce shaded stripes by this machine, the fabric, which is first wound upon the beam J^1, is passed from that beam between the upper and lower wheels or rollers F,

and F¹, when it is taken up by the other beam J, to which rotary motion is now communicated for that purpose. The fabric, when put in motion, turns the lower wheels, which are partially immersed in the dyeing liquor, and also the upper wheels, which press upon the fabric. The lower wheels F¹, (the peripheries of which are covered with felt or other similar material) by their rotary movement, take up a portion of coloring matter, and deposit it upon the fabric. By this means, the fabric is well charged with color in those parts which pass between and are in contact with the wheels, and on being wound on to the beam J, the color spreads by capillary attraction, and forms the required gradation of tint. This operation is to be repeated by reversing the motion of the cloth-beams, until the required depth of color is obtained for the stripes. The roller H, may then be raised, so as to blend the lighter shades of the stripes together, as before mentioned, by giving a tinge of color to the whole surface of the fabric; this may be repeated one or more times, according to the quality of the lightest shade which may be required; but if the shades are intended to be distinct, as will be the case when using two or more colors, as hereafter explained, the roller H, must not be used.

In order to produce the stripes at greater or less distances apart, it is only necessary to increase or diminish the number of bars E, and G, and wheels F, and F¹. The width of the machine may of course be varied, according to the width of the fabric to be dyed.

When fabrics of a thin texture, such as gauze, lace, &c., are to be dyed, the number of rollers may be diminished, as a sufficient quantity of the coloring matter will more quickly be taken up and penetrate the fabric.

In order to ensure a perfect production of the shaded stripes upon both sides of thick fabrics, such as flannels, felted cloth, &c., a modified arrangement of the above described apparatus (as shewn at figs. 4, 5. and 6,) is employed, by which means, a portion of dyeing liquor is deposited in stripes upon the upper surface of the cloth, as well as on the under surface, as above described. Fig. 4, is a longitudinal

elevation of this machine; fig. 5, a plan view of the same; and fig. 6, a vertical section, taken in the line 3, 4, of fig. 5. The addition consists of a vessel Q, Q, containing dyeing liquor, which is kept heated by a steam-pipe R;—S, S, are a series of cocks, attached to the bottom of the vessel Q, and are intended to supply a limited quantity of dyeing liquor to a series of small delivering-wheels or rollers T, T, at distances apart equal to the wheels F. The construction of the cocks, and their attachment with the rollers, will be clearly seen by referring to the enlarged sectional view fig. 6*. U, U, are rods, attached severally at bottom to the plug of each cock, and connected at top to a horizontal bar V; the forward and backward motion of which causes the cocks to open and close as required, and thus the quantity of liquor supplied to the rollers T, may be regulated.

The manner of working this machine is as follows:—The fabric is first passed between the upper and lower rollers F, and F^1, where its under surface receives the dye, which penetrates into the cloth; the cocks are then opened to the extent required, by moving the bar V; and the fabric, as it passes under the rollers T, is supplied on its upper surface with the dyeing liquor, which flows from the vessel Q, through the cocks S, S, on to the rollers T.

It is sometimes necessary (when operating with certain dark colors) to apply the coloring liquor to the fabric at a boiling heat; in such cases, the rollers T, are displaced, and sponge is applied to the ends of the tubes which descend from the cocks; this sponge, when brought in contact with the fabric, will convey the liquor direct to its surface, and consequently prevent the possibility of the liquor prematurely cooling, as would be the case if the rollers were employed.

This invention of obtaining stripes of shaded color may be further modified by the application of two or more dye-vats, containing different colors. The arrangement of the rollers will be as represented at fig. 7,—the set belonging to one vat, containing (say) a yellow color, being placed so as to intercept the spaces which the rollers in the other vat, containing (say) a red dye, have left on the fabric.

The patentee remarks, that many slight alterations in the

construction of the machinery might be shewn; for instance, he proposes to employ a series of rollers, mounted on one axle, and place any required number of such axles and rollers across the machine, instead of using the longitudinal rails E, and G, and the independent wheels or rollers mounted thereon. In some cases also it may be found desirable to heat the liquor in the vat by the direct action of the fire, instead of employing the arrangement of steam-pipes, as shewn in the drawing. He does not, therefore, restrict himself to the peculiar arrangement of apparatus shewn for effecting the shaded stripes of color; but claims the mode of variegating with shaded stripes, silk, cotton, woollen, and other fabrics, by the employment of a series of wheels or rollers, which dip into the dye-vat or vats, as above described, for the purpose of taking up a portion of color, and distributing it in lines upon the fabric. And, Secondly,—the method described with reference to figs. 4, 5, 6, and 6*, whereby the color is supplied through the medium of either rollers, or of sponge, or other similar absorbent substance, to the surface of fabrics, and thus a variegated or shaded surface is produced.—[*Inrolled in the Petty Bag Office, June,* 1845.]

Specification drawn by Messrs. Newton and Son.

To JOHN SMITH, *of Highbury Grange, in the parish of Islington, and county of Middlesex, merchant, for an invention of improved means and apparatus for shaping hats, —being a communication.*—[Sealed 21st January, 1845.]

THIS invention of improved means and apparatus for shaping hats refers to the operation of shaping the brim, which, for its perfect performance, has hitherto been dependent on the dexterity of the workman. By this invention it is stated, that more regularity of form can be given to the brims of hats than by the ordinary process; and also a great economy is effected in the time, and consequently the cost, of the operation.

The invention consists essentially in the employment of hollow moulds (heated by steam or other convenient means),

which are formed so as to give the proper shape to the brims of hats, when pressed down upon such moulds by properly shaped weights, as hereafter described.

In Plate X., the apparatus employed for this purpose is shewn in several views. Fig. 1, represents, in longitudinal elevation, a framing, carrying a series of hollow moulds for shaping the brims of hats; and fig. 2, shews the same in plan view. *a, a, a,* are the hollow moulds, constructed of metal, and shaped on their upper surface according to the style of hat-brim desired to be formed. These moulds are each in connection with a steam-pipe *b,* placed longitudinally of the framing; *c, c, c,* are branch-pipes, to conduct the steam from the pipe *b,* to the interior of the moulds; and *d, d, d,* are cocks for cutting off the supply of steam to the moulds, when it is no longer required. The waste steam and condensed water are drawn off from the moulds by the pipes *e, e, e,* which open into the waste-pipe *f.* In carrying on the operation of bending up the brims of hats, and setting them into shape, the patentee prefers, first, to place the hats upon a mould, formed like that shewn at a^1, and keep them in contact therewith, by the leaden weights *g, g,* cast to the form of the face of the mould, and made so as to embrace the hat, and cover nearly the whole of the brim, as shewn in the plan view, fig. 2. A wet sponge having been passed over the brim of the hat before placing it upon the mould, the heat, conveyed to the mould by steam, as before explained, will quickly soften the hat-brim, and bring it into a pliable state to receive a further pressure when placed upon either of the other moulds in the framing, which are finishing-moulds of varying patterns.

The form and construction of the moulds will be more clearly seen by the following figures:—Fig. 3, is a side view of the mould first to receive the hat, and fig. 4, is a plan view of the same. *h, i,* are two pins rising from the face of the mould to receive a block of wood, which is intended to fit the hat, and keep it in a central position on the mould. Fig. 5, represents one of the finishing moulds mounted on its framing, and in connection with the boiler for supplying steam for heating the series of moulds. *k,* is the boiler, set in brick-

work, in the ordinary way, and *l*, the fire-place. The steam is conveyed along the pipe *m*, to the pipe which runs longitudinally of the framing, and supplies the moulds through the branch-pipes, as above mentioned. Fig. 6, is a plan view of the mould shewn at fig. 5; fig. 7, is a cross section, taken in the line 1, 2, of fig. 6; and fig. 8, is another cross section, taken in the line 3, 4, of the same figure. It will now be seen, that if the hat (after the brim has been softened by the water and the heat of the mould a^1, as above explained) is placed upon the block on the mould *a*, fig. 5, and weights, of a shape corresponding to the surface of the mould, are laid on the brim, it will be made to assume a shape representing a counterpart of the mould. When, therefore, it is required to vary the style of the brim, according to the prevailing fashion, or the peculiar taste of individuals, it is only necessary to change the mould and its corresponding weights, and any required style of brim may then be produced. The time necessary for effecting the softening and shaping of the brim will depend somewhat upon the nature of the substance of which the hat is composed; and, for the same reason, the time will vary for keeping the hat upon the finishing or shaping-mould for the brim to set into its proper shape; but such matters will be readily determined by the experienced workman. It is found generally that one minute and a half is sufficient for softening the hat-brim, and about the same time is required to shape it on the finishing-moulds; the hat, with its wooden block, may then be taken off the mould; and when the brim is cool, the block may be removed from the hat.

The patentee states that he does not intend to confine himself to the exact plan of operation above described, as the softening and shaping may be done on one mould; and other plans may be adopted for pressing down the brim, instead of using the leaden weights; but he claims the construction and employment of moulds (heated by steam or other means) for shaping the brims of hats, as above described.—[*Inrolled in the Petty Bag Office, July,* 1845.]

Specification drawn by Messrs. Newton and Son.

To Dennis Woodin, *of Upper Park-place, Regent's Park-road, in the county of Middlesex, veterinary surgeon, for an improvement in the form of shoes for horses or other animals, and in the process of accomplishing the same,—being a communication.*—[Sealed 27th March, 1845.]

This invention consists in a peculiar mode of "roughing" the shoes for horses or other animals, in order to obtain a firm foothold.

In Plate XI., fig. 1, represents what is technically called the "upper side" of a horse-shoe, or that part which comes in contact with the ground when in use. *a,* is the sunk part or plate of the shoe, the "under surface" of which, or part that comes next the foot, is made to the ordinary pattern; *b,* is a projection, situated at the inner edge of the plate *a,* (or, in some cases, it may be at a distance therefrom, as shewn at fig. 2,); *c, c,* are a series of projections, which rise to the same level as the projection *b,* and may be said to radiate therefrom to the outer edge of the shoe; *d,* is a toe-piece; and *e, e,* two projections at the hind part of the shoe. The holes for the nails are made through the plate *a,* in the recesses between the projections *c, c.*

It is not necessary that the projections *c, c,* should form part of the projection *b,* although the patentee prefers such to be the case; he also prefers that the projections *c, c,* should all be on the outside of the projection *b,* as at fig. 1; but shoes may be made with projections *c, c,* inside the projection *b,* as at fig. 2; and the number of the projections *c, c,* as well as their shape, may be varied, without departing from this invention; the object of which is to obtain a sufficient surface for supporting the horse's foot, when upon the ground, by the use of a series of projections *c, c,* in combination with a projection *b,* toe-piece *d,* and hinder projections *e, e.* This object may be likewise accomplished by using the shoe represented at fig. 3, and fixing it on the foot by the nails represented in side and edge view, at fig. 4, the large heads of which form substitutes for the projections *c, c.*

Fig. 5, exhibits what is termed a concave shoe, with "course

fullering," and with projections at each side of the fullering at the hind parts of the shoe; the fullering and hinder projections come level with, and may be said to grow out of, the projection *b*. Fig. 6, is a shoe with a double fullering; the projections *b*, *b*, and *c*, *c*, support the weight of the horse, and in the recesses between the projections the nail-holes are made: the same effect can be produced by a single fullering.

The shoes may be made by casting them of malleable cast-iron, or by forging, or by dies,—or bars of iron for the shoes may be rolled.

The patentee claims the mode of making shoes for horses and other animals, as above described.—[*Inrolled in the Inrolment Office, September,* 1845.]

To Thomas Middleton, *of Loman-street, Southwark, engineer, for improvements in machinery for the manufacture of artificial fuel, bricks, tiles, and other similar articles.*—[Sealed 31st January, 1845.]

These improvements in machinery for the manufacture of artificial fuel, bricks, tiles, and other similar articles, relate to that description of machinery, employed for such purposes, in which a series of moulds are mounted radially on a rotating circular frame, and which moulds are brought under a stationary hopper to receive the composition to be pressed, and are then conducted under a plunger, where the requisite pressure is given to form the composition into cakes or bricks. The moulds are then carried forward, in succession, until they arrive over an opening in a fixed circular plate (which forms the bottom of the moulds), and by means of a piston or plunger rising up through this opening, the cakes or bricks of compressed fuel are discharged from the moulds, and are then removed by hand.

Machines constructed on this principle have been heretofore used for similar purposes, namely, making bricks and other similar articles, or forming artificial fuel into blocks. This part of the machine, therefore, forms no part of the present improvements, the object being merely to prevent

certain inconveniences to which machinery of this kind is liable.

One great inconvenience resulting from the use of this description of machine is, the liability of the clay or composition adhering to the plunger which presses the clay or composition into the moulds; and when such is the case, it is very likely to strain or otherwise derange some part of the machine. To obviate this inconvenience, the patentee has adapted a scraping apparatus, which is made to scrape and clean the plunger every time it rises, and before it descends on to a fresh brick. He has also constructed and adapted an hydraulic apparatus, whereby the pressure may be regulated as required.

In Plate XII., fig. 1, represents a machine, in side elevation, with the improvements adapted thereto; fig. 2, is a plan view of the same, with some of the upper parts removed, to shew the arrangement of the scraping tackle more clearly; fig. 3, is an end elevation, partly in section; and fig. 4, is a section, taken in the line 1, 2, of fig. 2. Motion is communicated to the machine by the fast pulley A, on the shaft B, on which is keyed the pinion C, gearing with a large spur-wheel D, mounted on the crank-shaft E. At the other end of this crank-shaft a mitre-wheel F, is keyed, which conveys motion to other parts of the machine, to be hereafter described. G, G^2, is the circular framing, composed of two cast-iron rings, which enclose a series of wrought-iron moulds *a, a, a,* set radially to the centre H, as shewn at fig. 2. This framing slides on the circular fixed plate W, fig. 5, and is guided in its course by the pieces Z, Z, which are bolted to the fixed plate, as represented in the detached view, fig. 5. Around the outer circumference of the framing G, G, are a series of ratchet-teeth or lugs, *b, b, b,* into which a click or pawle takes, in order to drive the moulds and framing round, as will be presently explained. I, is a mitre-wheel, gearing with the wheels F; it is mounted on the upright shaft J, which carries, at its lower end, a cam K. L, is a bowl or roller, having its bearings in the forked end of a horizontal arm M, connected to the lever N, which has its fulcrum at H. The outer end of this lever N, carries a pawle or click *c,*

(shewn by dots in fig. 2,) which takes into the teeth *b*, as before mentioned.

It will now be seen, that when motion is communicated to the mitre-wheel I, through the wheels C, D, and F, the cam K, upon the shaft J, will be made to revolve in the direction of the arrow, and acting upon the bowl or roller L, will bring the arm M, forward; which, being connected to the lever N, that carries the pawle *c*, will cause that pawle to come forward and force the circular framing through part of its revolution. By this means, the moulds to be filled will come in succession under two corresponding holes in a stationary hopper O, containing the composition to form the cakes of artificial fuel.

Fig. 5, represents a longitudinal vertical section, taken through the centre of one of the moulds, shewing the manner of attaching the moulds together. *a, a*, are the moulds, made of wrought-iron, their under edges being accurately planed smooth and square, to fit and lie close upon the bed-plate W, which is a circular ring. The moulds are also made smooth inside, in order that the composition may be forced out with greater facility; they are also firmly bolted to a cast-iron ring G, after being properly adjusted to receive the plunger in a proper manner, when they are filled with the composition. G^2, is another ring, surrounding the moulds, which are further secured by driving down wedges between the moulds and the ring G^2, as shewn at fig. 5. It will be seen, that the rings G, and G^2, are furnished, at their lower parts, with projecting pieces or heels, which work against two circular guide-rails Z, Z, bolted to the bed-plate W.

It will now be understood, that the moulds *a, a*, together with the circular framing G, G^2, are moved round in the manner above explained; the bed-plate W, and guide rails Z, Z, remaining stationary. The descent of the composition into the moulds is facilitated by arms or stirrers *d, d*, (see fig. 3,) which are caused to revolve, by means of the gearing shewn in the plan view, fig. 2, in which *e*, is a bevilled wheel, mounted on the top of the vertical shaft, which carries the arms *d*;—*f*, is a bevil-wheel, in gear with *e*, and mounted on the horizontal shaft *g*; to the other end of which is keyed a pinion *h*, in gear with the large spur-wheel D. The return

of the lever N, and its pawle or click *c*, to their original position, is effected as follows:—Upon the lower end of the shaft J, there is a cam P, which acts upon a bowl or stud Q, upon the forked end of the arm M; this cam P, is so set, with relation to the cam K, that its largest radius shall act upon the bowl Q, at the time when the smallest radius of the cam K, is in contact with the bowl L; or, in other words, when this latter cam is not in the position for acting. The cam P, will therefore, when it comes in contact with the stud Q, force back the arm M, and, consequently, the lever N, and cause the pawle *c*, to slide back over the ratchet-tooth immediately behind it, ready to push it forward upon the next movement of the cam K. The moulds being now filled, in succession, with the composition for forming the cakes or bricks, are, by the movements just explained, brought under the standards R, R, where the compressing apparatus is situated. This apparatus consists of two arms S, S, (see figs. 3, and 4,) forming a toggle-joint, to the upper end of which is attached a solid piston, working in a cylindrical recess above, formed in the head of the standards R, R, for the purpose to be afterwards explained. The lower end of this joint, at the hinge *i*, is attached to a sliding-piece U, furnished with guides, which work in corresponding ribs upon the standards. The piece U, rises and falls with the toggle-joint, and is intended to steady it in its upward and downward movements. Attached to the lower end of this sliding-piece is the plunger T, which is forced down into the moulds, as they come in succession under it, and compresses the composition contained in the moulds to the degree of solidity required.

This movement of the plunger T, is effected in the following manner:—Upon the crank E*, is a connecting-rod V, which communicates motion to the toggle-joint S. By reference to the side view, fig. 1, it will be seen, that the forward throw of the crank E*, will force the toggle-joint into its bent position, and draw up the plunger from the mould, as seen at fig. 4. The crank, as it continues its circuit, will gradually draw the toggle-joint into an upright position, which will, consequently, force down the plunger, and compress the fuel in the mould.

The contrivance for clearing the plunger from portions of the fuel, which sometimes stick upon its surface, is as follows:—Upon the side-framing, which supports the crank-shafts and gearing of the machine, are brackets *j, j,* which support a shaft *k*; this shaft is for the purpose of carrying a vibrating-frame *l,* having upon its sides projecting V-shaped ribs; by means of which ribs the scraper *m,* is supported, while at the same time it is capable of sliding backwards and forwards, when required. A slot or opening is made in the scraper *m,* as shewn at fig. 4, for the admission of the longer arm of a bell-crank lever *n*; the other end of this lever is jointed to a slotted lever *o,* attached by a pin to the vibrating frame *l*;—*n**, is the fixed centre of the bell-crank lever. In the slot of the lever *o,* a pin *p,* works; which pin stands out from a bracket bolted to the sliding-piece U; and as this sliding-piece descends simultaneously with the plunger T, the lever *o,* will fall by its own weight, and pressing down the shorter end of the bell-crank lever *n,* will force the longer arm outwards, and cause the scraper to be drawn back from under the face of the plunger. When the plunger again rises, by the throw of the crank E*, forcing out the toggle-joint S, and gets clear of the mould *a,* the pin *p,* which is now at the bottom of the slot in the lever *o,* will then rise up that slot, and, when arrived at the top, draw up that lever, and with it the shorter arm of the bell-crank lever *n*; when, by a simultaneous movement of the longer arm, the scraper *m,* will be forced forward, and scrape off whatever may be sticking on the face of the plunger. Another movement, which is effected by the rising and falling of the sliding-piece U, is the discharge of the blocks or cakes of compressed fuel from the moulds. This will be seen best at fig. 3, in which *q,* is a vertical rod, connected at its upper end with the sliding-piece U, and at its lower end with a vibrating lever *r, r,* working on a standard *s*; the longer end of the lever *r,* is connected by a vertical rod *t,* to a piston *u,* which fits the moulds *a, a*: the piston is guided in its descent by the guide-box *w.* The fixed plate W, W, over which the circular framing with its moulds moves, has an opening (as before mentioned), corresponding with the shape of the mould, and,

consequently, capable of allowing the piston *u*, to pass through it. The moulds are so arranged that at the time one comes under the plunger T, for its contents to be pressed, another mould, containing the compressed fuel, is brought immediately over the opening in the plate W; the descent of the sliding-piece U, will also bring down the lever *q*, and force up the longer end of the lever *r*, with the rod *t*, and piston *u*, which carries up with it the cake of fuel ready to be taken away by the workman. In order to regulate the pressure of the plunger T, so that there shall be no extraordinary strain on the machinery when an extra quantity of the fuel composition is deposited in the moulds, the patentee employs an hydraulic apparatus, shewn in section at fig. 3; which apparatus acts upon the solid piston X, jointed to the upper part of the toggle-joint, so as to resist any required pressure, but relieves the compressing apparatus when more than that amount is upon it. To the upper part of the standards R, R, a strong cylinder Y, is fixed, the lower end of which is open to receive the solid piston X. In the upper part of the cylinder a small hole *x*, is bored, for the admission of water to the upper surface of the piston. *z*, *z*, is a cistern, bolted upon the top of the cylinder Y, for holding water; this cistern also encloses a relief-valve, by which the water is supplied to, and allowed to flow back from, the piston, thus forming a resistance that will yield at any given pressure. y^*, is a passage in the relief-valve in connection with the hole *x*, and at its top it is furnished with a weighted valve *y*. The passage y^*, branches out into a passage y^1, furnished with a valve for supplying water to the cylinder Y. Supposing the plunger T, to have met with an unusual quantity of the fuel composition in the mould, the piston X, will be forced upward in the chamber Y, Y, when the water above the piston X, will necessarily be expelled from the chamber Y, through the vertical passage *x*, and be made to raise the weighted valve *y*, when the expelled water will escape through a lateral aperture into the cistern *z*, *z*. On the collapsing of the toggle-jointed levers S, S, before described, the piston X, will again descend in its chamber Y, and the vacuity thereby produced above that piston will cause the water to return

from the cistern *z, z,* through the passage *x,* by the rising of a conical valve *, and flow until it fills the whole space vacated by the descent of the piston x, to its usual position. By these means the pressure will be continually adjusted, according to the supply of the fuel composition in the moulds.

The patentee claims, Firstly,—forming the moulds for the bricks separately of wrought-iron, and attaching them together radially (as shewn in the drawing), by rings of cast-iron, and keys to adjust them to their exact position. Secondly,—the construction and use of the hydraulic apparatus in conjunction with the toggle-joint and plunger, by which means the pressure may be regulated as required. And, Thirdly,—the scraping apparatus for cleaning the under surface of the plunger as it comes from the moulds.—[*Inrolled in the Petty Bag Office, July,* 1845.]

Specification drawn by Messrs. Newton and Son.

To JOHN BERKELEY COTTER, *of the city of Dublin, gent., for improvements in the preparation and manufacture of woven fabrics or tissues, applicable to various useful purposes.*—[Sealed 26th September, 1844.]

BY this invention it is intended to produce woven fabrics or tissues, which shall be impervious to water; of a very thin substance, while at the same time they possess great strength for resisting the effects of rubbing, and the general deterioration arising from wear; of great tensile strength; capable of resisting such high or low degrees of temperature as they may be subjected to in ordinary use, without deterioration of the properties already mentioned; and being less inflammable than other fabrics, when exposed to fire.

The improvements in the preparation of woven fabrics or tissues consist in saturating the component parts of such fabrics or tissues with a composition made of the following ingredients :—1 gallon of boiled linseed oil; 1 lb. of white lead, raw; 26 oz. of powdered charcoal; 2½ oz. of litharge; and 2½ oz. of common salt. The oil is heated to from 85° to 95° Fahr., and then the other ingredients are added

gradually and separately to the oil, and mixed thoroughly by continued grinding or stirring.

The machinery employed for weaving the fabrics or tissues is of the ordinary description. The warp is formed of hemp or flax, and the weft of wool, cotton, or silk, or both warp and weft of hemp or flax, or of any other suitable materials. The fibres or threads of the materials intended to form both the warp and weft, or either of them, are saturated with the above composition; and, while the composition is yet in an undried state, they are made into fabrics by the ordinary process of weaving. The composition is also applied to yarns, threads, or strands, which are to be twisted or interlaced among themselves for any other purpose; and textile fabrics, made in the ordinary manner, may be likewise saturated with it.

The process of weaving the fabrics or tissues is carried on in an apartment wherein a temperature of from 60° to 80° Fahr., is maintained; and when the fabrics or tissues are made, they are submitted to the action of compressing cylinders or rollers, for the purpose of hardening and rendering the surface flat and uniform; they are then dried in the open air, at a medium temperature of the atmosphere, as from 50° to 60° Fahr.

The patentee claims, as his invention, the composition hereinbefore particularly described, and the application of the same to the manufacture of fabrics, by the process herein described, for the purposes and with the objects hereinbefore set forth.—[*Inrolled in the Inrolment Office, March,* 1845.]

To STEPHEN PERRY, *of Woodlands-place, St. John's Wood, in the county of Middlesex, Gent., and* THOMAS BARNABAS DAFT, *of Birmingham, manufacturer, for improvements in springs to be applied to girths, belts, and bandages; and improvements in the manufacture of elastic bands.*—[Sealed 17th March, 1845.]

THIS invention relates to improvements in springs to be applied to girth, belts, and bandages; and improvements in the manufacture of elastic bands.

The improvements in springs to be applied to girths, belts, and bandages, consist in making them of "vulcanized" India-rubber or caoutchouc; which material is described in the specification of letters patent granted to Thomas Hancock, 21st November, 1843*: it is prepared by combining India-rubber with sulphur, and submitting the combination to high degrees of heat; this has the effect of rendering the elastic character of the India-rubber more permanent, and preventing it from being so much affected by changes of temperature.

In making girths, belts, or bandages, with leather or woven or other fabric requiring elasticity, the strips of prepared India-rubber may be inserted between or connected with the different pieces of the fabric, or by the means of connecting together the separate parts of the girth, belt, or bandage.

Fig. 1, in Plate X., represents part of a girth, having at its end the prepared India-rubber strips *a*, which act as springs, and connect the buckle *b*, with the girth; the strips being securely retained between the surfaces of leather by stitching. Fig. 2, shews one end of a belt for the human body; the buckles *b*, *b*, are connected thereto by strips of India-rubber *a*, *a*. Fig. 3, is a knee-cap for horses, in which it will be seen that the buckles are connected with the straps by the strips *a*. Fig. 4, exhibits the application of these springs to the waist-band of a pair of trousers; and fig. 5, to the band of a waistcoat. In these cases, it is preferred to enclose the strips *a*, between two surfaces of woven fabric; the ends of the strips (when stretched) being fastened to the fabric. Figs. 6, and 7, shew how these springs are applied to braces and garters.

The improvements in the manufacture of elastic bands, consist in forming the prepared India-rubber into endless bands. Figs. 8, represent, in plan view and transverse section, a flat ring, cut out of a sheet of the prepared India-rubber; figs. 9, shew a cylindrical ring, cut out of a tube of the prepared India-rubber; and figs. 10, an endless band of an oblong form. These endless springs or elastic bands are suitable for a great variety of purposes, and may be made of any size and strength. They may be covered with leather,

* See Vol. XXVI., p. 178, of our present Series.

or with silk, or other fabric, to be used as belts, bandages, garters, or wrist-bands; also for going over other bandages to retain them in their places, instead of using bands of tape, &c.; and for retaining the paper or other coverings of jars containing preserves or other articles.

The patentees claim, Firstly,—applying springs, of the preparation of India-rubber herein mentioned, to girths, belts, and bandages, as above described. Secondly,—the making of endless elastic bands of the preparation of India-rubber herein mentioned, applicable to various purposes, as above described.—[*Inrolled in the Inrolment Office, September,* 1845.]

To JAMES MUSPRATT, *of Liverpool, Gent., for improvements in the manufacture of manure,—being a communication.* —[Sealed 15th April, 1845.]

THE object of this invention (which is a communication from Professor Liebig, of Geissen, in Germany) is to prepare manure in such a manner as to restore to the land the mineral elements taken away by the crop, which has been grown thereon and removed, and at the same time render the alkaline matters, used in making the manure, less soluble, so that they may not be washed away from the other ingredients, by the rain falling on the land. The improvements consist in combining carbonate of soda, or carbonate of potash, or both, with carbonate of lime, and combining carbonate of soda and carbonate of potash with phosphate of lime, in such a manner as to diminish the solubility of the alkaline salts used in the preparation of the manure. And although, in carrying out this invention, various materials are combined with the alkaline salts, no claim is made thereto, separately; and such materials are varied according to the matters which the land requires to have returned to it, in addition to the mineral substances before mentioned.

The mode of manufacturing the manure is as follows:—Carbonate of soda or potash, or both, is or are fused in a reverberatory furnace with carbonate or phosphate of lime; other ingredients are mixed with these fused compounds, as

hereafter mentioned; and the composition, when cold, is ground to powder, and applied to land as manure. In order to apply the manure with precision, the analysis and weight of the previous crop ought to be known, so as to return to the land the mineral elements in the same weight and proportion as they have been removed by the crop.

Two compounds are first prepared; one or the other of which is the basis of all the manures made under this invention. The first compound is formed by fusing four or five parts of carbonate of lime with two parts of potash of commerce (containing, on an average, sixty parts of carbonate of potash, ten of sulphate of potash, and ten of chloride of potassium, in one hundred parts), or with one part of potash, and one part of carbonate of soda. The second compound is made by fusing together phosphate of lime, potash of commerce, and soda-ash, in equal proportions. Both compounds are ground to powder, and other salts or ingredients are mixed with them (or those which are not of a volatile nature may be added when the compounds are in a state of fusion), so that the manure may represent, as nearly as possible, the composition of the ashes of the preceding crop; or if a crop of a different description is to be grown, the manure must be prepared accordingly.

The ingredients composing the manure, and the relative proportions thereof, will vary, according to the nature of the soil to which the manure is to be applied; but the patentee has given the following general proportions as a guide to the farmer:—Manure, suitable for land on which a crop of wheat has been grown, and removed therefrom, is made by mixing together six parts, by weight, of the first compound, above described, one part of the second, two of gypsum, one of calcined bones, a quantity of silicate of potash (containing six parts of silica), and one part of phosphate of magnesia and ammonia: this manure may be also used after growing barley, oats, and plants of a similar character. For land on which a crop of beans has been grown, the manure is composed of fourteen parts of the first compound, two of the second, one of common salt, a quantity of silicate of potash (containing two parts of silica), two parts of gypsum, and one of phos-

phate of magnesia and ammonia: this manure may also be applied to land after growing peas and plants of a similar character. The manure for land on which turnips have been grown consists of twelve parts of the first compound, one of the second, one of gypsum, and one of phosphate of magnesia and ammonia: this manure may also be used after growing potatoes and plants of a similar character.

When the straw of wheat and other plants, which require much silicate of potash, is returned to the land as manure (which mode the patentee considers to be the best for restoring the silicate of potash), the silicate of potash is omitted in the preparation of the manure.

The patentee claims the preparing and applying, in the manufacture of manure, carbonate of potash and carbonate of soda with carbonate and phosphate of lime, in such a manner as to render the alkaline salts in manufactured manure less soluble, and therefore less liable to be washed away by rain before they are assimilated by the growing plants.—[*Inrolled in the Inrolment Office, October,* 1845.]

To Samuel Knight, *of Spotland, near Rochdale, in the county of Lancaster, bleacher, for his invention of certain improvements in machinery or apparatus for scouring, washing, cleansing, and other similar purposes.*—[Sealed 3rd March, 1845.]

These improvements in machinery or apparatus for scouring, washing, cleansing, and other similar purposes, apply to that particular apparatus usually employed in such operations, and commonly called or known as the "dash or wash-wheel," consisting of a hollow cylinder or drum, mounted upon a shaft or spindle, and having compartments or divisions in which the goods to be scoured, washed, or cleansed, are placed; the wheel is then caused to revolve slowly (water or other cleansing liquor being introduced at the same time), and the goods are thus "dashed" or agitated backwards and forwards in the different compartments of the wheel, and partially washed and cleansed from their impurities. This contrivance answers

the purpose very well when washing with water alone, or with acid or bleaching liquor; but when employed for washing or scouring goods with soap it is defective, inasmuch as the goods being then much lighter than when being washed with water alone, they are apt to remain stationary against the sides of the wheel, instead of dashing or turning over and over in the soap, &c., which is highly essential to the proper and efficient washing and scouring of the goods. By the application of this invention, the goods to be scoured, washed, or cleansed, are caused to fall or descend quickly and forcibly into the soap or other scouring or washing matter employed, which will thus more perfectly penetrate the goods, and consequently improve their whiteness and softness of finish.

The manner of carrying the improvements into practical effect is as follows:—Upon a spindle or shaft, a hollow drum or cylinder, of the ordinary construction of dash-wheel, is mounted; but instead of dividing it, as usual, into four equal chambers, it is divided through the middle, so as to form two oblong chambers (parallelograms), the length of which is equal (or nearly so) to the diameter of the dash-wheel. Into each of these chambers some of the goods to be scoured, washed, or cleansed, are introduced; the wheel is then made to revolve slowly, which will cause the goods to fall quickly and forcibly into the soap, &c., twice at each revolution of the wheel, as each end of the parallelogram or chamber comes alternately uppermost; and the soap, &c., will thus be driven forcibly upwards through the goods, which will by this means be more perfectly and thoroughly scoured and cleansed, and receive a superior bleach and softness. A modification of this invention may be made by mounting oblong boxes or chambers (without a cylinder) upon a shaft, and causing them to revolve as before mentioned, which will have the same beneficial effect: or they may be made to swing backwards and forwards, merely performing a portion of a revolution, and approaching just sufficiently near to the perpendicular position to cause the goods to descend quickly to the lower end of the chamber.

The patentee claims as his invention, placing or working the goods to be scoured, washed, or cleansed, in an oblong or

other chamber, box, or vessel, and communicating such motion to it as will cause the goods to descend or fall from one side or end to the other of such chamber or vessel, in the manner and for the purpose above described and set forth.—[*Inrolled in the Petty Bag Office, September,* 1845.]

Specification drawn by Messrs. Newton and Son.

To Francis Watteeu, *of Finsbury-square, merchant, for improvements in preventing incrustation in steam-boilers and steam generators.*—[Sealed November 16th, 1844.]

The object of this invention is to prevent incrustation in steam boilers, by introducing therein a mixture composed of various chemical substances, according to the size of the boiler, and the nature or composition of the water employed for feeding the same.

The manner of using the invention is thus described by the patentee:—" For a boiler of from 1 to 10 horse power, supplied with water containing sulphate of lime, I use the the mixture No. 1, composed of

lbs.
4 catechu or terra japonica,
2 dextrine,
4 crystals of soda,
1 American potashes,
1 beet-root sugar,
1 alum,
1 gum arabic.

For a boiler of the same power, supplied with water containing chloride of lime, I employ the mixture No. 2, composed of—

lbs.
4 turmeric,
2 dextrine,
4 bicarbonate of soda,
1 American potashes,
1 molasses,
1 alum.

For a boiler of the same power, supplied with ferruginous water, I employ the mixture No. 3, composed of

lbs.
4 gum Gambia or Senegal,
4 salt of soda,
2 dextrine,
1 Russian potashes,
1 sugar,
1 alum,
1 gum arabic.

For a boiler of the same power, supplied with sea water, I employ the mixture No. 4, composed of

lbs.
4 catechu,
4 sulphate of soda,
4 dextrine,
1 alum,
1 gum arabic.

These substances must be mixed with about two quarts of water, and the boiler supplied therewith once a month for ordinary cases of incrustation, once a fortnight for hard or extensive incrustation, and once in six weeks for a very slight incrustation. Any competent engineer will be able from this description to judge how often the mixture is required to be applied.

For boilers of from 10 to 20 horse power the quantity of each ingredient must be increased one quarter. For boilers of from 20 to 30 horse power each ingredient must be increased one half. For boilers of from 30 to 40 horse power the quantity of each ingredient must be increased three-fourths. For boilers of from 40 to 50 horse power the quantity of each ingredient must be doubled, and so on, increasing one-fourth for every additional 10 horse power.

For steam-boat boilers of 30 horse power, supplied with river water, the following mixture is to be employed, to be renewed with every fresh supply of water:—

lbs.
6 crystals of soda,
6 dextrine,
2 alum,
1 pearlash,
2 sugar.

For steam-boat boilers of 30 horse power, supplied with sea water, the following mixture, renewed with each fresh supply of water, is to be employed:—

lbs.
8 carbonate of soda,
8 dextrine,
1 alum,
1 Russian potashes,
4 sugar.

The ingredients are to be increased in quantity one-fourth for every additional 10 horse power.

For a 30 horse power locomotive boiler, the following mixture is to be employed, and renewed every six days:—

lbs.
6 crystals of soda,
1 dextrine,
1 alum,
2 sugar.

I do not intend to confine myself to the exact proportions above set forth, as they may be varied. I would remark that I am aware that soda and potash have before been used for such purposes; I do not, therefore, claim the use of either soda or potash separately; but what I claim is, their use, combined with some of the other matters herein mentioned."—[*Inrolled in the Inrolment Office, May*, 1845.]

To Esprit Galibert, *of Bridge-street, Southwark, in the county of Surrey, hatter, for certain improvements in hats.*—[Sealed 7th April, 1845.]

The first part of this invention relates to the foundations of the brims of silk hats, which have been hitherto made by cementing two pieces of cotton cloth together; and the improvement consists in forming the same of a single texture of cotton, of about three or four times the ordinary thickness of English cottons. This description of fabric has been made for some time past in France, and employed there for children's clothing, and in the manufacture of what are termed spring hats.

The second part of the invention consists in introducing into the bodies of silk and beaver hats, at those parts where they come in contact with the head, and also into the brim, for the space of about an inch or more around the orifice, a layer, and in some cases two layers, of the membrane formed from the *intestinum rectum* of animals, and commonly used by gold-beaters, which will prevent any grease or oil passing through the hat from the head of the wearer. In silk hats the membrane may be introduced between the two pieces of calico of which the body is formed, or between that body and the leather or other lining, or immediately under the silk shag or plush on the outside of the body. In beaver hats the membrane is inserted between the body of the hat and the leather or other lining.—[*Inrolled in the Inrolment Office, October,* 1845.]

To JOHN DIXON, *of Wolverhampton, iron-master, for improvements in heating air for blast-furnaces and for other uses.*—[Sealed 27th April, 1844.]

THIS invention consists in employing the heat derived from blast furnaces, when in operation, for heating the air used in smelting the products in the furnace, while it is passing from the blower to the tuyere-pipes. According to the ordinary method, the air is heated in an oven, at some distance from the blast furnace, and conducted to the tuyere-pipes through tubes, at a considerable cost.

The mode of carrying out the present improvement is, by letting into the brick-work, forming the sides of the lower part of the furnace, one, two, or more chambers, immediately over the tuyere-pipes, and within about three inches of the inner face of the furnace. These chambers enclose a bent tube, or instead of the tube, passages may be made therein, through which cold air, supplied by any suitable blowing apparatus, passes, and in its course becomes heated; the hot blast, thus produced, will find an exit through the tuyere-pipes into the furnace.

When air of a great heat is required, it is proposed, in place of the brick-work, to face the air-chambers with clay or

stone-work, perforated with holes, through which the heat of the furnace passes direct to the chambers. Instead of the heated air passing off from the chambers, as above mentioned, it may be carried away from the furnace by pipes, and be employed for any other purpose.

In Plate XII., are several views of the improved apparatus. Fig. 1, is a vertical section of the blast furnace, with the air-chambers applied thereto; fig. 2, is a plan view of the same; and fig. 3, shews a chamber detached, with one of its sides removed. *a*, *a*, are the chambers, made of cast or wrought-iron, and set in the sides of the furnace. Each of these chambers is furnished with a bent pipe *b*, one end of which is in connection with the blowing apparatus, and the other with a pipe *c*. Cold air being supplied to the pipe *b*, it is conducted over a large heating surface, and when it arrives at the end of that pipe it enters the pipe which is connected with the tuyere-pipe, and thence passes into the blast furnace. The chamber *a*, in front of the furnace, is connected to another of the chambers by the pipe *d*; and, in like manner, if the heat of the blast is required to be very great, the whole of the chambers may be connected together, so as to allow of the air circulating through all the pipes or passages *b*. Fig. 4, shews the chamber when provided with partitions, which form passages for conducting the air, instead of pipes: if thought desirable, a coil of pipe may be employed without the case or chamber.

The patentee claims heating air for blast furnaces and other uses, by employing the heat of the sides and front of the lower part of a blast furnace to heat the air, as above described.—[*Inrolled in the Inrolment Office, October*, 1844.]

To CHARLES ROBERT ROPER, *of Hackney, chemist, for improvements in the manufacture of gelatine.*—[Sealed 22nd April, 1845.]

THIS invention consists in manufacturing a concentrated preparation of gelatine from bones, combined with sugar and the essence of lemon or almonds, or with other essences or essential oils, to be used for making jellies and *blanc-mange.*

The gelatine is prepared from bones or ivory in the following manner:—The cylinder of a digester is charged with bones (sheep-bones being preferred), broken into small pieces, or reduced to dust, and six gallons of water are added to each hundred-weight of bones; the digester is then closed, and steam admitted from a boiler at a pressure of 20 lbs. per square inch; after the expiration of an hour, the pressure is gradually raised to 32 lbs., which is continued for three hours and a half, and the charge of gelatine is then drawn off—if the dust of bones or ivory has been used, gelatine is pressed out of the charge after its withdrawal from the digester; but this is not requisite when the bones have been only broken into pieces, and placed in a strong woollen fabric. The gelatine is run into shallow tins or pans, and afterwards dried on nets, in the usual way; it is then well washed, and melted with an equal weight of sugar, flavoured with essence of lemon, when for jellies, and with essence of almonds, when for *blanc-mange;* and these matters are melted in a digester, by steam. When essence of lemon is used, it is in the proportion of 2 drachms to every 3 lbs. of gelatine; it is first mixed with the sugar, which is added to the gelatine after the latter has been melted with lemon juice, in the proportion of 18 oz. of lemon juice to 3 lbs. of gelatine. Essence of almonds is used in the same proportion as the essence of lemon; but water is substituted for the lemon juice. Other essences or essential oils may be used in a similar manner.

The gelatine, prepared as above, is placed in jars for sale. Jellies may be quickly made therefrom by the use of boiling water, containing the white and shell of an egg, adding wine according to taste. To make a *blanc-mange* only boiling milk is required.

The patentee claims, as his invention, the manufacturing a concentrated preparation of gelatine from bones, combined with sugar and the essence of lemon, or with the essence of almonds, or with other essences or essential oils, as above described.—[*Inrolled in the Inrolment Office, October,* 1845.]

To Charles Louis Matthurin Fouquet, *of Jermyn-street, Haymarket, in the county of Middlesex, Gent., for improvements in the preparation of an artificial vegetable gum, to be used as a substitute for gum Senegal.*—[Sealed 22nd April, 1845.]

The subject of this invention is the manufacture of an artificial gum, which is to be used as a substitute for gum Senegal.

The materials employed in the preparation of the gum are the fecula of potatoes, sago, starch, and crushed malt; and their relative proportions are, 100lbs. of the fecula of potatoes, 20lbs. of starch, 20lbs. of sago, and 20lbs. of malt. A quantity of water, equal to about six times the weight of the fecula of potatoes, is placed in a vessel, and heated, by a hot-water bath, to a temperature of 25° or 30° of the Centigrade thermometer; the starch is then introduced, and when it has been thoroughly mixed with the water, the fecula of potatoes and sago are stirred in; the malt being now added, the whole is well stirred up, and heated until it is brought to a gummy state: this will generally take place in about an hour after the malt has been added; and then, in order to ascertain if the mixture be properly prepared, a small portion of it is put upon a white plate, and mixed with tincture of iodine, which will change it to a blue color if it has not been sufficiently operated upon, or to a reddish violet color if it be properly prepared. At this stage of the process the heat from the hot water bath is discontinued, and the temperature of the mixture is raised to from 100° to 105° Centigrade, by means of steam pipes at the lower part of the vessel; the steam is then shut off, and the mixture or gum, after being allowed to remain for an hour, is filtered through a thick woollen cloth or other suitable material. The gum is now concentrated, by placing it in another vessel, heated by steam pipes, and thus driving off the water which is mixed with it. If the gum is required to be brought to a dry state, the water is first driven off, and then the gum is divided into small pieces, and left to dry;—the drying will take place more quickly if half an ounce of essence of turpentine be added

to every hundred pounds of the gum whilst the evaporation is going on.

The patentee claims the preparing vegetable materials into an artificial gum, by combining the fecula of potatoes with malt, with or without sago and starch.—[*Inrolled in the Inrolment Office, October,* 1845.]

To William Lloyd Caldecott, *of Bath, in the county of Somerset, Esq., for an improvement in the manufacture of soap.*—[Sealed 17th March, 1845.]

This invention consists in combining Barbadoes tar and other bituminous substances, such as petroleum and other varieties of natural naphtha, with soap made in the ordinary manner.

The Barbadoes tar, or other bituminous substance, is combined with the soap in the proportion of about 15 per cent., and it is stirred in when the soap is at a temperature a little below that of boiling water. The soap alone retains its solvent powers in water; the Barbadoes tar or other bituminous substance remaining insoluble, and floating on the surface of the water; hence, when used for cutaneous eruptions, the soap will detach any foreign matters from the skin, and thus facilitate the action of the tar thereon. The compound soap also does not produce that unpleasant irritation which frequently results from the use of common soap.

The patentee claims, as his invention, the combining Barbadoes tar, or other variety of natural naphtha, with soap, as above described.—[*Inrolled in the Inrolment Office, September,* 1845.]

To Hyppolite Chauvier, *of the city of London, Gent., for improvements in the manufacture of soap.*—[Sealed 17th April, 1845.]

This invention consists in manufacturing both soft and hard soap from the hair or fur of seals or other marine animals.

To make soft soap, the hair or fur is put into a copper with caustic potash leys, and kept boiling for five or six hours; and then, if the hair be not entirely dissolved (which

can be ascertained by drawing up some of the materials from the bottom of the copper in a ladle) more leys are added, and the ebullition is continued until the hair or fur is entirely dissolved;—the strength of the leys is from 12° to 18° of the Centigrade scale. To make hard soap, the base of the alkali used is changed, by throwing into the copper as much common salt as will be equal to half the weight of the hair or fur; the materials are boiled briskly for an hour, when a second decomposition takes place, which changes the soft soap into hard soap, and causes all foreign substances to fall to the bottom; the contents of the copper are then left to repose for twelve hours: this process is applicable when the soft soap is made from other matters—and, instead of using potash leys for the first operation, soda leys may be employed; but then the foreign substances will not precipitate so well. After the materials have rested for twelve hours, the copper is opened, and the spent leys are withdrawn; the remaining matter will be found to be the combination of the caustic alkali with the oily substance of which the hair is formed, or, in other words, a saponification of hair. The foreign substances being separated, as above mentioned, the patentee proceeds with the manufacture of the soap with caustic soda or potash leys, according as the soap is to be hard or soft. After boiling for some hours, the soap is again allowed to rest, and the spent leys withdrawn; this operation is repeated twice with fresh and weaker leys, and a clear yellow soap of excellent quality is thus obtained.

The hair or fur may also be mixed with oils, grease, or tallow, and saponified with these substances; but it is preferred to make the soap from hair or fur separately, and mix it with soap made from oils, fat, or tallow, before putting the soap into the frames.

The patentee claims,—Firstly, the manufacture of soap by employing the hair or fur of seals or other marine animals. And Secondly,—the process above described, which consists in changing the base of the alkali, so that, by a double decomposition, a purer and more dense soap may be obtained.—[*Inrolled in the Inrolment Office, October*, 1845.]

To Henry Phillips, *of Clist Honiton, in the county of Devon, chemist, for improvements in purifying gas.*—[Sealed 15th April, 1845.]

The purification of coal gas is effected, as is well known, by what are termed the wet and dry lime processes, in both of which fresh lime is used; now this invention consists in employing for the wet lime process the lime which has been used in the dry lime process, and thereby produce a considerable saving of lime.

The patentee first passes the gas through the wet lime purifiers, and afterwards through the dry lime purifiers. He uses fresh lime for the dry lime process; and then, instead of considering the lime, when discharged from the dry lime purifiers, as no longer suitable for purifying gas, he causes so much of it as may be required for the wet process to be immediately mixed with water, in a vat or other receiver, to prevent it from becoming hard; and this lime is subsequently brought to the proper consistence for the wet process by an additional quantity of water.

The patentee claims the mode of purifying gas, above described, by applying lime which has been used for the dry lime process, to be then used for the wet lime process.—[*Inrolled in the Inrolment Office, October,* 1845.]

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 209, Vol. XXVII.)

The advantage of a considerable amount of space in the furnace, over the fire-bars, has been already mentioned, but no very decisive experiments have been made on this subject. Three cubic feet of space to each superficial foot of grate-bar surface, may be stated as a good proportion, where there is nothing to prevent this amount being obtained. When the space is reduced below

one foot and a half of grate, it will be found to be attended with a marked disadvantage.

The area of the flue, and subsequently of the chimney, through which the products of combustion must pass off, must be regulated by their bulk and their velocity. The quantity of air chemically required for the combustion of 1 lb. of coal, has been shown to be 150·35 cubic feet, of which 44·64 enter into combination with the gases, and 105·71 with the solid portion of the coal. From the chemical changes which take place in the combination of the hydrogen with oxygen, the bulk of the products is found to be to the bulk of the atmospheric air required to furnish the oxygen, as 10 is to 11. The amount is therefore 49·104. This is without taking into account the augmentation of the bulk, due to the increase of the temperature. In the combination which takes place between the carbon and the oxygen, the resultant gases (carbonic acid gas and nitrogen gas) are of exactly the same bulk as the amount of air, that is, 105·71 cubic feet, exclusive, as before, of the augmentation of bulk from the increase of temperature. The total amount of the products of combustion in a cool state would therefore be $49·104 + 105·71 = 154.814$ cubic feet.

The general temperature of a furnace has not been very satisfactorily ascertained, but it may be stated at about 1000° Fahr., and at this temperature, the products of combustion would be increased, according to the laws of the expansion of aëriform bodies, to about three times their original bulk. The bulk, therefore, of the products of combustion which must pass off, must be $154·814 \times 3 = 464·442$ cubic feet. At a velocity of 36 feet per second, the area, to allow this quantity to pass off in an hour, is ·516 square inch. In a furnace in which 13 lbs. of coal are burnt on a square foot of grate per hour, the area to every foot of grate would be $·516 \times 13 = 6·708$ square inches; and the proportion to each foot of grate, if the rate of combustion be higher or lower than 13 lbs., may be found in the same way.

This area having been obtained, on the supposition that no more air is admitted than the quantity chemically required, and that the combustion is complete and perfect in the furnace, it is evident, that this area must be much increased in practice, where we know these conditions are not fulfilled, but that a large surplus quantity of air is always admitted. A limit is thus found for the area over the bridge, or the area of the flue immediately behind the furnace, below which it must not be decreased, or the due quantity could not pass off, and consequently the due quantity of air could not enter, and the combustion would be proportionally imperfect. It will be found advantageous in practice, to make the area 2 square inches instead of ·516 square inch. The imperfection of the combustion in any furnace, when it is less than 1·5 square inch, will be rendered very apparent, by the quantity of carbon which will rise unconsumed along with the hydrogen

gas, and show itself in a dense black smoke on issuing from the chimney. This would give 26 square inches of area over the bridge, to every square foot of grate, in a furnace in which the rate of combustion is 13 lbs. of coal on each square foot per hour, and so in proportion for any other rate. Taking this area as the proportion for the products of combustion, immediately on their leaving the furnace, it may be gradually reduced, as it approaches the chimney, on account of the reduction in the temperature and consequently in the bulk of the gases. Care must, however, be taken, that the flues are nowhere so contracted, nor so constructed, as to cause, by awkward bends or in any other way, any obstruction to the draught, otherwise similar bad consequences will ensue.

An idea is very prevalent, that it is advantageous to make the flame, or hot gases (as they may be termed, because we may look upon flame merely as a stream of gases heated to incandescence) impinge upon, or strike forcibly the plates of a boiler, at any bend or change of direction in the flue. The turn in the flue is therefore made with a square end, and with square corners; but it is difficult to see on what rational grounds the idea of advantage can be upheld. The gases, if they are already in contact with the plate, cannot be brought closer to it, and any such violent action is not necessary to alter the arrangement of the particles of the gases and bring the hotter particles to the outside, while there is great risk of an eddy being formed and of the gases being thrown back and returned upon themselves, when they strike the flat opposing surface; thus impeding the draught and injuring the performance of the boiler. That circulation will take place to a very great extent, among the particles of heated gases, flowing in a stream even in a straight flue, will be apparent, from those particles next the surface being retarded by the friction against the sides, and by their tendency to sink into a lower position in the stream, from their having been cooled down and become more dense. An easy curve is sufficient to cause great change in the arrangement of the particles, as those which are towards the outside of the bend, have a much longer course to travel and are thus retarded in comparison with the others. From these causes the hotter particles in the centre of the flowing mass, are in their turn brought to the outer surface and made to give out their heat. The worm of a still is never found returning upon itself with square turns, as if the vapour inside would be more rapidly cooled by its impinging on the opposite surface; yet the best form of worm is a subject which has engaged the attention of many able men, and therefore, may well be taken by engineers as a guide in the management of a similar process, though carried on at a much higher temperature.

Another very prevalent practice and which also would seem to be open to serious objections, is, that the flues are frequently made of much greater area in one part than in another. This

arises from a desire to obtain a larger amount of heating surface than is consistent with the proper area of the flue, or with the amount of the heated gases which pass through it. The flue is thus made shorter in its course than it ought to be in proportion to its sectional area. This is even sometimes done, by placing a plate of iron partly across the flue, near the bottom of the chimney, thus suddenly contracting the passage for the gases. The effect of this is evidently to cause a very slow and languid current in the larger part of the flue, and the consequence is, that a deposition of soot rapidly takes place there. In many marine and land boilers, having one internal flue in them, of too large a size, this will be found to be the case; soot being soon deposited, till the flue is so filled up, that the area left is only such as is due to the quantity of heated gases passing through it; the value of those parts of the sides of the flue which are covered with soot is thus lost.

This is well exemplified in Mr. Dinnen's paper on marine boilers in the Appendix to Weale's edition of Tredgold,* where he states, that the flues of the boiler in H. M. Steamer 'African,' after she had performed a great deal of work, in the course of five weeks' time, during which period there was no opportunity of sweeping them, were found to be in exactly the same state as after a voyage of only five days, or probably as they would have been found, after a much shorter time, if they had been examined. These flues are about the same area throughout their whole length, but the chimney is of much less area. In the first portion of the flue from the fire, no soot was deposited, but the deposit began after the first turn that the flue took, and gradually increased in amount to the foot of the chimney. The inference that may be drawn from this fact appears to be, that the gases, at first highly heated and thereby expanded, filled the first part of the flue; but as they were cooled, they became more contracted in their bulk, regularly towards the chimney, and therefore allowed the soot to be deposited in the space not properly filled by them in their course, and all soot subsequently formed was carried out at the chimney top, by the velocity and power of the current. The amount collected near the foot of the chimney and in the portions of the flue furthest from the fire, diminished the amount of the surface of the boiler exposed to the action of the heated gases, and the efficiency of the boiler was therefore impaired to the same extent. In those boilers in which the flues, before reaching the chimney, are very much too large and are contracted, as has been stated, by a plate put across them, the extent to which their efficiency is thus impaired, must evidently be much greater and to a serious extent, as this evil exists in them in a very much greater degree.

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* Vide 'The Steam Engine,' by T. Tredgold. 4to. London, Weale, 1838. Appendix I.

The due amount of heating surface that ought to be given in a flue, to carry off the caloric, or to cool down a given quantity of heated gases, has not yet been investigated with any great degree of accuracy, and practice varies widely under different circumstances. The largest proportion is allowed in the Cornish boilers, some of which have not less than 30 feet and even 40 feet of heating surface to one foot of grate. This appears to be more than is justified by any corresponding gain, and certainly more than would be advisable in any marine or locomotive boilers. In boilers burning 13 lbs. of coal per hour on each superficial foot of grate, a proportion of 18 feet to each foot of grate, will be found to give good results. Where slow combustion is carried on, and where an extra size of boiler is not objectionable, some advantage may be gained, by increasing the amount in proportion to the amount of fuel consumed. In calculating this surface, it is usual not to include the bottoms of the square flues in marine boilers, and in circular flues from $\frac{1}{4}$th to $\frac{1}{3}$rd of the surface should be deducted as bottom surface, and therefore not efficient as heating surface. It is not usual to make any distinction between horizontal and vertical surfaces, though it is probable that the former are considerably more valuable. The efficiency, however, of some boilers which have been made with vertical tubes, would rather tend to make it doubtful whether so much difference exists between the value of horizontal and vertical surfaces, as has been generally supposed.

If the area, instead of being in one large flue, be subdivided into a number of small flues, or pipes, so as to expose the gases to the required amount of surface in a short course, the distance traversed between the fire-place and the chimney does not seem to be important. The velocity of the current of gases will not be materially influenced by their subdivision, as the whole amount of the surface, with which the gases must come in contact, tending to impede their course by friction, will be the same in both cases. It is evident that numerous small flues, by subdividing the large stream of gases, which in the other case flow off in one body, bring the greater proportion of the particles at once into contact with the surfaces, and therefore render it unnecessary to pay the same amount of attention to the turning of the stream and the bringing out the hotter particles from the centre of the flowing mass. If these proportions of area through the flues and of heating surface, be duly attended to, the results anticipated may be depended upon, whether flues are of large area, or are composed of a large number of smaller tubes.

The time occupied by the gases in passing through the boiler, from the instant of their generation, to that of their leaving the boiler and the length of the course through which they have travelled, have sometimes been looked upon as matters of great importance. Where the gases are travelling in one compact mass, it is evident that distance and consequently time (as the

velocity with which the current flows is the same in all cases) must be allowed, for the different particles of this large mass, so to circulate among themselves, as that each may have an opportunity of coming into contact with a cooling medium, to give off its heat; but if the large mass of gases is so subdivided, that the different particles are sooner brought into contact with the due amount of cooling medium, then the time the gases remain in the boiler ceases to be of importance.

When the gases have reached the foot of the chimney, in a well-proportioned boiler, they will be found to be reduced to a temperature of about 500° Fahrenheit, or below it; their bulk will, in consequence, be reduced by about $\frac{1}{3}$rd below their bulk, on their first leaving the furnace. The reduction in the area of the flue, ought not to be in the same proportion, because their velocity is no longer so great. The reduction ought to be made gradually, as has been stated before, and not by a sudden contraction at the foot of the chimney, as the effect of this is to cause a slowness of draught in the latter part of the flue and consequently a deposition of soot; and then the surface, so covered, which had been reckoned upon as effective heating surface, is lost. The area of a chimney, to allow the products of the combustion of each pound of coal consumed in an hour, to pass off, should be not less than $\frac{3}{4}$ths of 2 square inches, this latter being the area given for the flue, immediately behind the fire-place—that is, $1\frac{1}{2}$ square inch; and for a boiler burning 13 lbs. of coal per hour, on each superficial foot of its grate, the area should be $\frac{3}{4}$ths of 26 square inches, or $19\frac{1}{2}$ square inches.

Theoretical research not having as yet given us any valuable assistance, in determining the proper height of a chimney, we must again refer to practice as our guide. A good draught may be obtained with a very low chimney, but at a great expenditure of fuel, from the necessity that exists in such a case for allowing the gases to pass off at a much higher temperature than would otherwise be necessary. For a chimney built of brickwork, the height ought not to be less than 20 yards, and may be increased to 30 yards or 40 yards, with advantage in the economy of fuel. When chimneys are carried to a still greater height, it is generally for the purpose of carrying off the smoke, or any deleterious gases, from the immediate neighbourhood, or to create a good draught with gases at a lower temperature than those from a steam-boiler furnace. On board steam vessels chimneys are limited in their height by the size of the ship, on account of the influence the chimney has on the stability and appearance. It will generally be found advantageous to make the chimney as high as these circumstances will permit.

It will be found to tend greatly to the efficiency of a boiler, to allow a large space in it as a reservoir for steam. The surface for ebullition does not seem to be of much importance, in comparison with this point.

In the application of the foregoing proportions to practice, no reference need be had to the form of the boiler; the same results will be obtained, whether the boiler be circular, waggon-shaped, or any other form, if all the other circumstances be made the same.

By due management in the process of firing, when these proportions are given to the furnace and flues, the combustion will be found to be such, that but little carbon will pass off to be converted into smoke, and the results will show great economy in the consumption of fuel.

June 25th, 1844.

The PRESIDENT in the Chair.

"Account of the removal of the Light-house at Sunderland." By John Murray, M. Inst. C. E.

SUNDERLAND is rated the fourth port in the United Kingdom, as respects the aggregate amount of its tonnage. The shipment of coal, which is the principal business of the place, amounts annually to about 1,300,000 tons. Lime is also extensively shipped for Yorkshire and Scotland. There are various manufactories in the town and neighbourhood, and the building of ships is carried on to a great extent. The population of the united towns of Sunderland, Bishopwearmouth, and Monkwearmouth, amounted, according to the census of 1841, to 57,057 including about 4000 seamen.

The harbour has been, since the reign of George I., under the control and jurisdiction of Commissioners, appointed by Parliament. For some years past, the average revenue, arising principally from the shipment of coal, has amounted to about £16,000 per annum. The funds, so collected, have been expended in deepening the shoals, removing rocks and other obstructions, and building piers at the mouth of the river. These piers, having been originally executed in a superficial manner, soon showed symptoms of decay, and it was found necessary to rebuild the eastern or seaward portion of them.

The late Mr. John Rennie was consulted, and his advice was, that the piers should be prolonged with solid masonry into deeper water. The south pier has, in consequence, been rebuilt in a substantial manner with ashlar masonry, in blocks of stone, varying from 5 to 7 tons in weight, properly backed with a glacis of rubble stone.

The eastern part of the north pier, during the last ten years, has been taken down, under the author's superintendence; a new pier has also been built, in the direction suggested by Mr. Rennie, and approved by his son, Sir John Rennie. This pier has been executed in the strongest manner and with excellent materials, forming altogether a handsome and substantial piece of

masonry. The most beneficial effects have been produced by the adoption of these plans; the channel to sea has been straightened and deepened by dredging, and the bar has been lowered, and kept in a stationary position, so as to give 4 feet of water upon it during low water, or 18½ feet at high water of ordinary spring tides.

Near the termination of the north pier, there was built, in 1802, by Mr. Pickernell, then engineer to the Commissioners, an octagonal Light-house of polished stone. Its height was 60 feet 2 inches from the base to the cornice, terminating with the lantern, the cupola of which was 16 feet above the cornice, making a total elevation of 76 feet 2 inches above the pier. Its breadth was 15 feet at the base and 8 feet 6 inches at the cornice, having a spiral staircase up the centre of the building. It was subsequently lighted with coal gas from nine patent burners with parabolic reflectors.

In the beginning of the year 1841, before the works at the north pier head were terminated, an alarming breach was made by the sea in the projecting part of the old pier on which this Light-house stood, and it became imperative, either to take down the building immediately, or to repair the pier in an expensive manner.

On the 7th of April, 1841, the advantages of having a new Light-house on the high ground near the fort, on the south side of the river, and the difficulties of removing the present one from its then critical situation, were discussed at the Board of Commissioners. The result was, that the author received directions to prepare the materials necessary for carrying into effect the project he had suggested, of removing the building in an entire state, on a cradle of timber, to the eastern extremity of the new pier.

In consequence of the breach before alluded to, it was necessary to remove the Light-house in a northerly direction, on to the new pier, before it could be taken to the eastward, and its axis required to be turned, in order to make it correspond, or be parallel with the altered direction, east and west of the new pier. The raised platform of the new pier head, where the building was proposed to be placed, being 1 foot 7 inches higher than the original site of the Light-house, it became necessary, in providing a proper height for the entrance doorway, either to descend a few steps from the platform, or to lift the base, and consequently the whole building, to the proper level. It was deemed advisable to adopt the latter course.

The first of these operations was to take the building northward. On the 15th of June, the masons began to cut apertures on the north and south sides of the building, for the reception of the cradle or platform of timber; the two middle balks were readed through consecutively, and the apertures were made no ger than absolutely necessary for that purpose. The upper

course of stones below the torus moulding was not disturbed, and the bottom of this course was made to rest immediately upon the cradle timbers. The upper surfaces of the beams, where they were in contact with the masonry, were covered with thin sheet lead, to equalise the pressure. When the timbers were threaded through the building, screws were applied beneath them, until they were closely pressed to the course of masonry, and uprights of timber were then inserted and firmly wedged up, which allowed the screws to be removed. Less difficulty was experienced in inserting the next timbers, which were parallel to the other pair and supported the external masonry; they were covered with lead like the others, screwed up and shored with timber uprights and wedges in a similar way. Care was taken to place all these shores in such positions, that they should not interfere with the insertion of the lower transverse tier of timbers.

An aperture was next cut on the eastern side of the base (the entrance door on the west side not requiring any), to admit the two tranverse beams, which were firmly screwed up underneath the beams previously inserted, and then shored with uprights and wedges to relieve the screws. Other timbers were next inserted and shored up in pairs, in a similar way to the others, and when all these were secured, other apertures were cut through the building to admit the upper timbers.

The next operation was the insertion of the timbers, with the rails fixed upon them. The centre timbers immediately below the upper beams were fixed first. These were firmly bedded on the stone pavement of the pïer and upon the solid masonry of the new work. The sheave balks to each were then threaded through the building, and firmly wedged to the timbers above and to the rails below, by a series of wedges. The other rail and sheave balks were placed in a similar manner, underneath each upper timber and in the order in which they were inserted in the building. Finally, when all these wheels were brought to their bearing, the small portions of the original masonry, left in the four corners of the building, were cut away at one time, and the two remaining intermediate upper timbers were threaded through and secured.

While these works were in operation, an octagonal shaft was tied together in the following manner. The two planks, 44 feet in length and 3 inches in thickness, were suspended from the cornice at each angle of the shaft, and then lashed closely to the masonry by ropes and wedges. Five horizontal tiers of iron straps, $2\frac{1}{2}$ inches broad, and $\frac{7}{8}$ths inch thick, were made to embrace the building, and these were drawn closely up by screws to the above-mentioned planks and filling-in pieces.

Immediately above the cornice and on a level with the light-room floor, eight apertures were made through the walls (which were here only 10 inches in thickness) and pieces of timber were pushed through the apertures from the inside and drawn back

again till they met in the centre. Strong plates of malleable iron covered the joints above and below the timbers, and screwed bolts passed through the whole. This upper platform was connected with the cradle below by a large chain, passing round a strong bar of iron at the top of the platform, and round a similar bar of iron on the lower side of the cradle, and the chain was drawn tight by a large screw.

The upper platform was further connected externally with the cradle, by eight main uprights of timber, 12 inches square, tenoned into the horizontal timbers at the cornice and brought close to the masonry of the building at the base, and secured to the cradle and upper platform by stirrup-straps and bolts. The uprights were united together by three tiers of chock-pieces. Three iron straps, 3½ inches broad, and 1 inch thick, passed round the chock-pieces and uprights, and the whole was drawn closely to the building by screws.

The raking braces were next erected, and their feet passed between the timbers of the cradle and cill-beams fixed thereon, so that the whole framing could be firmly bound together. The four diagonal beams and ledges, fixed to the raking braces, further prevented any of the timbers from springing or twisting.

Up each angle of the building, above the cornice, battens, 2½ inches thick, were fixed, with two tiers of horizontal junction pieces, kept together by binding screw straps. The dome of the building, which is of iron, covered with lead, was fastened by chains passing round the summit and the upper cornice and continued down to the projecting timber of the upper platform, each chain being tightened by screws. The large plates of glass of the light-room were taken out, and window sashes, with ordinary crown glass, were put in their place. The light, however, was exhibited nightly, as usual, during all the operations of removal; a lead pipe, lengthened as required, being connected with the gas-works on the pier.

On the 2nd of August everything was prepared for drawing the building northward. For this purpose, five pulling screws were strongly fixed to the glacis of the pier, north of the building, and chains were attached to them and to the cradle upon which the light-house rested. These screws were worked by twenty-four men. Four forcing screws, worked by three men to each, were applied behind the cradle, to assist in propelling it. The total number of men employed on the occasion was forty. The cradle was supported on one hundred and forty-four wheels, which travelled on eight parallel lines of rails, but the extreme ends of the cradle were supported and moved on slide balks only. The operations for the removal northward were commenced at half-past 3 P.M. and at a few minutes after 8 P.M. it was safely landed on the new pier. The distance travelled was 20 feet 5 inches.

On the 7th of August the building was drawn, in a similar manner, to a further distance, northward, of 8 feet 1 inch.

The cradle was then shored with timber uprights, which allowed the railway and sheave balks to be withdrawn and reversed, for the purpose of taking the building to the eastward.

It is unnecessary to describe the process of placing these railway and sheave balks in a direction bearing east and west, as it is merely a repetition of the same operations previously mentioned. Some difficulty was experienced in taking the building round the curve, which was a portion of a circle of 647 feet radius.

The rails on this curve were laid level, to the point at which the tangential lines of the rails commenced, and from that point to the new pier-head, they had a gradual inclination of 1 in about 225, making a total rise of 1 foot 7 inches above the original base of the building. This was accomplished, on the raised platform, by different heights of timber beams, and on the unfinished part of the pier, between the platform and the coping, by large stones set in mortar, on which the railway beams were solidly fixed.

The series of wedges in the sheave balks, not only allowed them to be removed when required, but were otherwise of great use, for by slackening the wedges on the east side and tightening those on the west, the building was retained in a perpendicular position, when the rails were on the inclined plane.

On one portion of the raised platform of the pier, the pavement was completed with large Yorkshire landings, from 6 inches to 8 inches in thickness. It was questionable whether they would be able to bear the great pressure of the building; but it was determined to try it, as the stones had been laid with the greatest care on a proper bed of rubble stone and the joints run with pozzolana mortar. As a precaution, planks were laid upon the pavement, to equalise the pressure, and particular attention was paid to have the rail balks securely and thickly wedged upon the planks. Under the great load of the building very little impression was made upon the paving; in some few instances the joints of the mortar were cracked, but no stone whatever was broken. This is particularly noticed, because every practical man who inspected the pier, was of opinion, that the stones would not bear the pressure.

The cradle was supported on what are termed by ship-builders sliding balks; that is, the lower side of the travelling beam was convex, fitting into and sliding along the concave surface of the lower beam, which was solidly fixed upon the pier. These beams were greased with a mixture of soft soap and black lead, to diminish the friction. The sliding beams were connected with the cradle by a framing of timber, which formed part of the moving mass, with the view of saving expense, as it avoided the necessity of raising the surface of the pier to the level of the railway beams. The principal weight of the building was, however, thrown upon the railways, and, comparatively, nothing of any consequence on the sliding balks.

Immediately underneath the area of the building the cradle wheels were placed close together, but outside the area of the building they were separated from each other. Each of the wheel-plate castings had the under surface covered with a piece of felt dipped in tallow, and it was then secured to the sheave balk by a tapering wedge. By so doing, the timber was not injured with bolt-holes, and the casting could at any time be easily taken out and replaced with another, had any accident happened to it. The spindles of the sheaves were very accurately turned and the sheaves were likewise turned, to take off all irregularities from the surface. The rails were secured to the timbers by short spikes, formed with a head turned at right angles with the body, which allowed them to be easily drawn without much injury to the timber, when the rail had to be removed.

The cradle beams were all squared and planed, to distribute the pressure over the whole surface. They were of American oak, which is a very solid wood, and as it could be procured straight in long lengths, it was preferred to any other timber. The rest of the timber employed was Memel red and yellow pine. During the latter part of the operations the cast-iron rails were laid upon a plank of African oak, 1½ inch thick, fixed upon the railway beams, as it was feared that the great weight would press the rails into the Memel timber.

The method employed in taking the building to the eastward, was different from that which was first attempted in moving it northward. The slow process of drawing the cradle forward by screws was abandoned, and recourse had to three ordinary winches. Each was worked by six men, with one man to hold on the tail-rope, which before arriving at the winch, passed through a two-fold and threefold sheave block. The total number of men employed at the handles of the winches was eighteen, and the power of them when so applied, may be reckoned at 562½ lbs. The radius of the handles of the winches being 14 inches, worked a cog-wheel of 4½ inches diameter, turning a spur-wheel of 30 inches diameter, and a barrel of 10 inches diameter. The additional power of the twofold and threefold sheave blocks makes the whole power of the eighteen men, applied in the manner stated, to be 52,480 lbs. The gross weight moved was calculated to be 757,120 lbs., or 338 tons. The distances traversed were determined by the various lengths of the railway beams, which were taken up and relaid forward, to save expense, but which of course prolonged the time of taking the building to its destination. The greatest speed with which the mass moved, was at the rate of about 84 feet per hour, the winches being advantageously placed; but the average actual rate was 33¼ feet per hour. The greatest distance accomplished at one time was 40 feet 7 inches; the average distance being about 28 feet. The actual time employed in moving the building to the eastward was 13 hours 24 minutes; that distance being 447 feet 1 inch; to which, if 28 feet

6 inches be added, what it was taken north, will make the total distance traversed 475 feet 7 inches.

On one occasion, an experiment was tried with only two winches at work; it was found that with twelve men at the handles, the cradle could be drawn forward, but at a slower velocity than ordinary, and the men were much fatigued with their exertions.

The Americans have been successful in moving houses to a considerable distance, but the weight was generally distributed over a large area of the foundations, which allowed the cradle to run upon slide balks, and saved the expense of wheels and railways. Those who had seen the operation in the United States, strongly advised the adoption of the same principle. The great weight of the light-house at Sunderland, however, concentrated into an area of 162 square feet, caused a contrary decision. If reliance had been placed solely on the sliding balks, it is very probable the attempt to move the mass would have proved a failure; inasmuch as even with the internal railways and wheels, it sometimes required the utmost exertions of the men at the winches to pull the cradle forward. The outer part of the cradle, which bore the weight of the raking braces, was, to save expense, supported on sliding balks: on one occasion, when the ropes were tightly stretched, a few blows given to these sliding balks, caused the cradle, with its enormous weight, to start suddenly forward a distance of nearly 2 feet. In consequence, they were always tapped afterwards, whenever the cradle encountered any obstacle to its motion. M. le Bas experienced the same difficulty in moving the Luxor obelisk, both in Egypt and in Paris, where a great force was employed to drag it forward. The huge rock of the statute of Peter the Great at St. Petersburgh, was moved on balls of brass, turned very accurately and running in brass channels; yet they frequently stuck fast, and required the attention of a man to each, with an iron rod, to keep them in motion and equidistant from each other. The use of railways, with wheels moving in carriages fixed to the cradle, undoubtedly saved trouble and expense, and to a certain degree reduced the friction.

At the time of building the new pier, preparations were made for the site of a light-house, by piling an area of about 20 feet square in the centre of the head, founding upon the piles and bringing up along with the other work, a mass of masonry, in large blocks properly squared and bedded solidly in Pozzolana mortar. The foundation was therefore in readiness for the reception of the building. On the 4th of October it was brought to its destination. Timber uprights were immediately wedged up under the cradle, which permitted the different sheaves and railway balks to be withdrawn. Upon this being done, the masons commenced operations by building on the foundations above alluded to, pillars of stones with retreating courses, striking the shores, from time to time, as these pillars took their bearing under the original masonry.

The mortar used was made from blue lias lime, with a mixture of sand and Pozzolana, and was laid in very thin joints. The chief difficulty arose in making good the last course, as the joint had to be made rather thicker than usual, for the admission of the masonry. The stones of the course, before insertion in the building, had their upper surface covered with thin sheet lead, firmly beaten down and lapped for a breadth of 2 inches over the back part of the stone. This was done, to equalise the pressure and to prevent the external masonry from being flushed, by the weight of the building it had to sustain. The joints were run with grout through the funnel of a tube, carried up a few feet in height, to give additional pressure. They were previously closed all round with Roman cement, excepting a few apertures left on purpose for the air to escape, and which allowed the grout completely to fill the joint. Great care was taken to make the masonry sound and perfect, by properly bonding the joints, both internally and externally, by which means there is not any indication of the building having ever been displaced. The masonry was completed on the 12th of November.

Before cutting into the light-house for the insertion of the cradle, the different corners of the base were accurately levelled with an instrument, and trial was made whether the building was exactly perpendicular, by a plummet. From time to time, as the building was moved forward, other trials were made for the like purpose, and also after it had been brought to its destination on the new pier head. In all cases it was found to be as at first. No settlement was ever perceptible, even where the new masonry was placed, on withdrawing the cradle; nor has the slightest crack appeared since in any part of the building.

The timbers and the chief part of the other materials employed, were used in other works, then carrying on by the Harbour Commissioners, and the men who worked at the winches, when they had accomplished their task, were taken off to other work connected with the building of the pier. The cost of carrying the work in question into execution, amounted to £827. The building was erected in 1802, at an expense of upwards of £1400. If to £827 be added £280, the estimated cost of a light-keeper's dwelling, gas-house, and other apparatus,—it would have made £1107, as the total expenditure of this department. The estimated cost of building a new light-house on the high ground near the Fort, with a tide light on the north pier, dwellings, and other contingencies, amounted to £2000; consequently, by adopting the removal of the building, as is above mentioned, there was a saving of £893, and no inconvenience was experienced from the want of a harbour-light.

Since the completion of this undertaking, the author has had the honour to receive the thanks of the Board of Commissioners for his exertions; and a piece of plate of the value of £100 has

been unanimously voted to him as a further acknowledgment of his services on that occasion.

The paper is accompanied by six drawings (Nos. 3677 to 3682), showing a plan of the pier, with a plan and sections of the light-house, and exhibiting the details of the apparatus used in its removal.

ON THE USE OF MADDER IN DYEING AND PRINTING CALICOES, &c.

BY M. SASS.

(Translated from La Société d'Encouragement, for the London Journal.)

The object of this branch of our manufactures is to unite the coloring matter of the madder with the mordants previously fixed in the fabric. Our almost entire ignorance of the manner in which this combination is effected is the most serious obstacle to be met with by the manufacturer, as it deprives him of any certainty of attaining the desired object; in fact, the art of printing calicoes has hitherto been, and still is, almost entirely founded upon experience.

The fundamental conditions necessary for the proper carrying out of this operation, that is to say, the union of the mordant with the fabric, and of the coloring matter with the mordant, having been properly effected, *i. e.*, the fabric having been dyed, any accidents which may afterwards happen may be easily foreseen, and, consequently, may be generally avoided. Among these are the defects caused in brightening or bringing out pinks and violets; these are only produced when, on employing too strong a mordant, or too small a quantity of solution of tin or sulphuric acid, the bath has to be heated to a higher temperature than 30° Reaumur. The violet spots which appear upon pinks, especially in designs with a ground, arise from the contact of ferruginous matters, which is dangerous, especially if the fabrics undergo the brightening process before they are submitted to the action of the soap; the color is then so sensitive that I have seen it instantly change to violet under the influence of a perfectly limpid drop, but which fell from a bar of iron upon which it had condensed. An iron nail fixed in the oaken planks of a brightening vat, although sunk one-third of an inch below the surface, stained all the fabrics brightened in the next compartment. The white stains which appear upon violets after undergoing the brightening process, appear whenever pieces badly washed are treated with hypochlorite of soda, or if this latter is sprinkled over them before being washed; this is obviated by well washing the fabrics after undergoing the brightening process, and by placing the vat containing the hypochlorite at a distance from the brightening vat.

These few examples will suffice to prove that all the variations which occur in printing calicoes arise from the fact of our not knowing how the combination of the coloring matter, the mordant, and the fabric are affected. When this has been discovered, the causes which influence it will also be found out, and only then will there be any certainty of always obtaining products of fine quality.

Combination of the Mordants with the Fabric.

The causes which determine this are either physical or chemical. Among the first, the impression presents defects arising from the fabric, the engraving, the color, and the pressure exercised whilst printing. The more regular and fine the texture of the fabric, the more perfect will be the impression; if, however, the texture is too close, the mordant, being unable to penetrate, remains on the surface of the fabric, in scales, which partially peel off, and only gives, upon dyeing, dull and unequal colors.

With regard to the engraving and pressure, what we are about to state concerning cylinders applies equally to block-printing. If the engraving on the cylinder is not of equal depth throughout, unequal shades are produced. The cause of this defect has been turned to advantage, in order to obtain two different shades with a single cylinder and color; it is sufficient, for example, in order to produce, with the same cylinder, red and pink, to engrave those parts which are to produce the latter tint less deep than those which are to produce the red. As this kind of design, which is very difficult to engrave, furnishes for the lighter shades very little color, it is almost impossible to obtain them uniform and without spots or inequalities, which is more perceptible after the brightening process; it is therefore chiefly employed for deep blues, &c. The manner of engraving also greatly influences the intensity of the colors. Bitten and outlines always produce deeper shades than what is technically called chalk engraving, as the latter takes up much less color than the others.

The speed at which the cylinder is driven must also be taken into consideration, as the faster it revolves the lighter will be the shades, because it deposits less color upon the fabric. If the pressure upon the roller is too great, although the texture of the fabric may be suitable, the color passing through the fabric is not fixed there, and produces, on dyeing, very bad and unequal shades; if, on the other hand, the pressure be too light, the same defect is produced, but from a different cause, as in the latter case, the color merely touches the fabric, and does not penetrate, but remains on the surface, and ultimately falls off. This method of printing is subject besides to another very serious inconvenience, that of producing unequal shades, arising from the action of the pressure cylinder upon the engraved cylinder never being perfectly uniform; and this defect, which may be

avoided by great pressure, appears on the contrary in all its force when the pressure is too light.

It will hence be perceived, of what importance it is that the pressure from the handle upon each extremity of the presser cylinder should be as uniform as possible, in order to obtain a uniformity of shade. This defect in printing may be easily ascertained; it is only necessary to examine both edges or selvages of the fabric, which ought to be precisely similar; if one is of a deeper shade than the other, the pressure is not uniform.

The defects arising from the color depend upon its thickness and the nature of the mordant. If the color is too thick, it does not enter into the lines of the engraving; if too thin, it runs and spoils the design: a medium between these must be found, which long experience alone can teach, and which varies not only with each kind of fabric (the color being thinner in proportion as the texture is fine), but also with each kind of design; for the more the design is charged, the thinner the color must be; for this reason, designs printed on a colored ground, can only be well done with gum colors, as those with starch cannot, without being decomposed, be diluted beyond a certain limit, which is not adapted to obtain the desired object. Colors thickened with gum have the defect of producing, during printing, a great deal of froth, which, if not removed as fast as it forms, becomes fixed upon the fabric, and only produces feeble colors, as it contains but little mordant. Starch colors froth up very little, and this may be easily prevented by adding a little sulphate of lead, which appears to act in dividing the mass. The thickeners also exercise respectively a peculiar action upon the mordants; thus, a color which, thickened with starch or flour, is very deep, is much less so when thickened with gum or burnt starch; this latter substance, in dyeing, gives much less brilliant shades than starch or gum. Gum tragacanth, dextrine, salep, and sugar, act precisely in the same manner as gum, and produce brilliant colors.

The physical causes of the defects occasioned by the drying of the pieces after printing, arise from excess or deficiency of heat, and the stagnation of the air. The drying must take place as rapidly as possible, in order to prevent the colors from spreading upon the fabric, and spoiling the design; and, for this purpose, the drying-stoves are ordinarily heated to 30° Reaumur, in order to dry the pieces directly. Care must, however, be taken not to exceed that temperature, which is known by practice to be the best for mordants, especially for the aluminous ones; as, by that means, the colors might become incrusted, and fall from the fabric, which is especially the case with those prepared with gum. A less degree of heat is maintained when the cylinders are charged with very strong iron mordants, or steam colors, and especially ground colors, which are the more brilliant the more slowly they are dried.

The air must be renewed as often as possible in the stoves, in

order to carry off the vapours of water and acid which are disengaged from the printed pieces; as the former might spoil the design by damping it, and the latter by transforming the mordant into an acetate, which would not combine with the fabric, and would therefore produce white spots. The same observations apply to the stretching, in which the pieces are hung up several days after printing, before dunging, in order to combine the mordant with the fabric; the temperature must not exceed 10° or 15° Reaumur, and the air must be sufficiently damp, that, in cooling, the pieces may be creased or folded without any rustling; they must not, however, be too damp, as the mordant would run. A certain degree of humidity, which may be known by experience, and which can be ascertained by a hygrometer, is indispensable to the union of the mordants with the fabric, especially when they have a base of iron, tin, iron and alumina, or tin and alumina.

The action of the air upon the fabrics, while hanging to dry, is chemical, although produced by physical causes: in effect, the damp air penetrates the stratum of color, and softens it, and carries off the acetic acid of the mordant, leaving the alumina with which it was chemically combined, but not yet in combination with the fabric, as it only combines therewith by a suitable degumming operation, without which only dull and feeble colors are produced.

At the degumming operation the purely physical causes which influence the combination of the mordant with the fabric cease; they are so closely allied to the chemical causes, that it is only by a long and persevering study of their action that the point where the former end, and the latter begin, can be ascertained. It appears that the degumming operation acts in a different manner, according to whether the pieces are submitted thereto immediately after printing, or after hanging to dry for forty-eight or sixty hours.

The action is chemical and mechanical; chemical in the first instance, because, if chalk or some other carbonate be not added to the dung-bath in sufficient quantity to saturate all the acid of the mordant, the latter will detach itself from the fabric, and become dissolved in the bath,—mechanical, because it facilitates the combination of alumina, either pure or in the state of a sub-sulphate, with the surface of the threads of the fabric. This assertion is confirmed by the fact, that the centre of all dyed threads remains perfectly white, the coloring matter never going beyond the surface.

In the second case, all the acetic acid being separated from the mordant, the dung only is employed; the action of which is probably merely mechanical.

The mechanical action of the dunging is not confined to the union of the alumina with the fabric, by rendering it insoluble; but it also carries off a portion of the mordant not combined with the fabric; and likewise dissolves the thickening matter, which

contains a considerable quantity of it. For this reason, the degumming operation may be performed with equal advantage either with bran, dung, the dunging salt of Messrs. Kestner, or even by running water alone: this latter, which acts very slowly, especially in winter, is used chiefly for light colors, prepared with gum or torrefied starch; it possesses, besides, the disadvantage of allowing the mordant, which flies off from the impression, to fall upon the white parts of the piece and stain them, if the least fold or crease should be formed.

If there were no other action in the operation of degumming than that just pointed out, one would be led to imagine that the pieces would be perfectly dyed in the madder-bath, without degumming, as the madder possesses the same properties as the dung, which are all that are requisite for carrying off the thickening matter and the excess of mordant, and for allowing that portion which remains upon the fabric to become permanently fixed; but it is not so; the madder-dyed pieces never give good results, unless previously degummed; feeble colors, and imperfect and stained designs, are produced. This circumstance, contrary in appearance to the theory which I have deduced from facts, is easily explained, on comparing the action of the dung-bath with that of the madder-bath. As the pieces are put into the dye-bath whilst it is in a cold state, and before the mucilage has become dissolved, the thickened colors, being diluted without being dissolved, are detached by the movement communicated to the pieces, and carry off nearly all the mordant they contained; whilst, by the dunging operation, nearly all the mordant is fixed in the fabric, when the bath is sufficiently hot to carry off rapidly the thickening matter dissolved therein; and, moreover, all the excess of mordant which, in the dunging operation, is rendered insoluble, and carried off by the animal and vegetable mucilage, not meeting with that of the madder in solution, which would also take it up, falls back upon the fabric, combines therewith, and stains it. The six following experiments confirm this theory:—

A piece of ordinary calico, which had been printed about a week with a mordant alumina thickened with starch, was divided into six equal parts, of about 8 inches long by 4 wide, and treated as follows:—

No. 1,—Degummed, at a temperature of 12° Reaumur, in a dung-bath, prepared 12 hours previous with 500 grammes of dung to 4 quarts of water.

No. 2,—Degummed also in a similar bath, but heated to 50° Reaumur.

No. 3,—Was placed, without degumming, at a temperature of 12° Reaumur, in a madder-bath, composed of 32 grammes of madder, of the best quality, to 4 quarts of water.

No. 4,—Was placed, without degumming, in a madder-bath,

similar to No. 3, which had been prepared, in a cold state, 12 hours previously.

No. 5,—Was placed, without degumming, at 30° Reaumur, in a bath composed of 64 grammes of madder and 125 grammes of dung to 4 quarts of water.

No. 6,—Was degummed in water only, at 12° Reaumur, and dyed like No. 3.

Nos. 1, 2, and 6, after being degummed, were beaten, washed, and then dyed separately, in a similar manner to No. 3. With the six pieces, the dye-bath was raised in three quarters of an hour to 80° Reaumur, at which temperature it remained during 15 minutes; they were afterwards soaped, then brightened, and soaped a second time.

Results.—Nos. 1, and 2, were equal in beauty; in No. 3, the impression was imperfect, and the ground stained; in No. 4, the tint was as uniform as No. 1, but with only half the depth of color: this arose no doubt from the mordant flying off, and combining with the madder, thereby rendering a portion of its coloring matter insoluble. No. 5, tint so feeble as to be scarcely perceptible, caused by the absorption of the coloring matter of the madder by the ligneous part of the dung. No. 6, as fine as No. 1.

Let us now examine the processes of degumming most frequently employed. The operation of dunging is ordinarily effected between 30° and 65° Reaumur, in a wooden vat, 6 feet long, and 5½ feet in width and depth, well filled with water; in which, for 40 pieces of 50 yards long and ¾ wide, about 60 quarts of dung are dissolved, which is at the rate of three pints each piece; they are passed through it for a quarter of an hour, and on being taken out are rinced and beaten; they are then ready to be dyed, or to be again passed through the dung, in order to ensure a successful operation. There is no disadvantage in employing more than 60 quarts of dung for 40 pieces; but a less quantity must not be employed, as, in that case, the mordant, which leaves the fabric, not finding the mucilage necessary to precipitate it, is deposited upon the pieces which are passed through, and stains them.

The temperature at which the degumming may be performed is not very important, provided it be not lower than 30° Reaumur; for, in that case, its action would be very slow, there being no action from 0° up to 10°, as the mordant runs upon the fabric before the thickening matter is softened. When chalk or pipe-clay is added, it must be in the proportion of 500 grammes for each piece.

The time for the pieces to remain in the degumming-vat is, in general, a quarter of an hour; it must be prolonged in proportion to the coolness of the bath.

In roller-vats the pieces only remain two minutes, the action of the bath being so uniform upon the whole piece that the effect is, so to speak, instantaneous.

The same observations apply to degumming with bran and with the dunging salt; which process is effected upon forty pieces, with 15 kilog. of bran, or with 250 grammes of salt; care being taken to boil the first, in order to spread its mucilage throughout the bath, and to dissolve the second. With regard to the degumming by cold water, which is the most simple,—it consists in plunging the pieces in running water, keeping them well spread out, and leaving them there until all the thickening matter is removed; they are then carefully washed and beaten before dyeing: but this is neither an economical nor a certain process; for the least crease in the fabric forms a stain, because the excess of mordant not being carried off by the water, becomes deposited upon the fabric, and remains attached thereto.

Degumming, by the use of chalk or pipe-clay only, is chiefly employed with iron mordants; it is liable to cloud aluminous mordants, probably because it combines with them in small quantities; that which would induce the belief of this is, that pinks degummed by the use of chalk only, have always a veiny tint, which is far from agreeable.

The greater the quantity of mordant employed, the less intimate is its combination, and, in consequence, the more easily detached, which is frequently proved in carrying on the process of dunging too rapidly; in that case, designs with two shades of the same color, one over the other, lose the more intense, which then becomes dull and lighter than the other; it is to avoid this defect that pieces printed with several colors are degummed twice, and even three times, in succession.

On coming from the dunging-vat, the pieces are washed several times in running water, beaten for a quarter of an hour, and washed again, in order to remove any particles of mordant or dung which might adhere thereto: they may then be dyed.

Experience has shewn, that the degumming by dung gives the best results; and this substance being very susceptible of change, according to the kind of food taken by the cows, it may be concluded that its action is not always the same. In fact, we are of opinion that a variety of accidents in dyeing, attributed to the maddering, are owing simply to the use of dung, formed from matters which have changed its nature; and as long as this substance is employed for such a purpose, the process will always be liable to very injurious variations. It is therefore necessary to remedy this evil, of which the extent may now be appreciated. Messrs. Kestner, in giving us their phosphates, have furnished us with the means, and we think that in this respect they have made an important improvement in the art of printing calicoes, &c.:—by using their salt we have always obtained favorable results.

Having now reviewed the means of combining the mordant with the fabric, we will proceed to the process of combining it with the coloring matter.

[*To be continued.*]

Novel Inventions.

ATMOSPHERIC RAILWAY.

A NEW modification of the means of communicating tractive power to carriages on railways, worked upon the pneumatic or atmospheric principle, is about to be introduced, by means of which two miles in three of the long series of air tubes will be dispensed with, and a corresponding diminution of the volume, required to be exhausted, will be obtained. No longitudinal opening and valve is required, and consequently no loss from leakage will be experienced.

The invention is the production of an amateur, and presents some very plausible features, which (considering the many difficulties connected with the working of atmospheric railways that are now said to have been overcome,) may not be found impracticable. The details, as exhibited to us, are at present rather crude, but in the hands of an experienced engineer may perhaps be considerably improved. There are some fallacies connected with the arrangement, but these may be thrown overboard, without detracting from the main features of the project. We expect shortly that the plan will be adopted as an experiment, when we shall be at liberty to speak more fully of its construction and novel features.

PREVENTING THE EFFECTS OF CONCUSSIONS ON RAILWAYS.

THE frequent recurrence of accidents on railways by the concussions of carriages coming in contact with each other, several of which have been attended with the most direful consequences, has induced many persons to suggest means by which the effects of such accidental rencounters may be rendered less calamitous. Among these, Mr. Fuller, of Brownlow Street, has recently obtained a patent for the adaptation of a peculiar construction of buffers, of large dimensions, to be applied behind and before all the carriages of a train, so that in the event of a concussion, the great amount of elastic surfaces intervening may neutralize the effects of the sudden blow, and cause the carriages to be forced back again to their proper distances apart.

It has been noticed that when the ordinary buffers at the ends of the carriages meet, they have, from their low positions, a

tendency to lift the carriages off the rails. This has been the effect in several instances, and, under great pressure from behind the carriages, have been made to run into and crush each other (as was recently the case near Leeds), or to ride over one another, as in the fatal catastrophe which occurred some years ago on the Paris and Versailles railway. Mr. Fuller has, by extending his buffers to the upper parts of the carriages, removed this objection, and enabled the buffers to receive and resist the blow effectually in a horizontal direction, in the event of a collision, by which there will be no tendency in the carriages to rise upon the rails, so as to ride over each other, and the possibility of the buffers protruding through the carriages will be avoided.

LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

1845.

Sept. 29. *Andrew Dacey*, of No. 5, Red Lion Court, Christchurch Spitalfields, for the "Boethomonochier," or machine for assisting one-handed persons to feed themselves.

29. *Thomas Evans & Sons*, of Great Sherston, Wiltshire, for a five-furrow drill for manure, turnips, and corn.

29. *Charles Powell*, of Smith's-buildings, Leadenhall-street, London, for a form for grooved and seated bar iron.

30. *Mc Dougal, Sambourne, & Bell*, of St. Paul's Churchyard, for the collar Victorine.

Oct. 2. *John Keyse*, of 27, Crosley-row, Walworth-road, for the Albert swimming apparatus and life preserver.

4. *Holker Meggison*, of Highfield, near Southampton, for a cartridge case.

4. *John Robinson*, of Nos. 3, 4, and 5, Nassau-place, Commercial-road, London, for a waistcoat.

4. *W. Rodenhurst*, of Market Drayton, for an improved straw-cutting engine.

6. *James Chadnor White*, of Tewkesbury, Gloucestershire for a harness tug.

7. *William Allen*, of Morgan's-place, Liverpool-road, Islington, for a philosophical corn and bunion shield.

Oct. 8. *Thomas Gibbons*, of 18, Upper East Smithfield, for a self-adjusting cot.

8. *Charles May*, of 8, Curtain-road, Shoreditch, for a screw-cap for bottles, &c.

9. *Charles Bray*, of 14, Cranbourne-street, Leicester-square, London, for a culinary vessel.

9. *Benjamin Nicoll*, of 42, Regent Circus, Piccadilly, London, for a shirt.

10. *George Bassett*, of 341, Strand, Westminster, for an instrument for impregnating liquids with gases.

15. *John Whitehouse & Son*, of Birchall-street, Birmingham, for a letter clip and universal holder.

15. *Robert Marples*, of Carver-street, Sheffield, for a brace-head.

15. *William Jenkins*, of 10, London-street, Fitzroy-square, for an expanding and collapsing piano-forte case.

15. *Mark Frearson*, of 14, Hanway-street, Oxford-street, for a railway carriage disconnector.

16. *Jones & Co.*, of the Light-house, 201, Strand, for the "Fountain coffee pot."

16. *John William Edgson*, of Etton, Northamptonshire, for a dibbling instrument.

16. *William Thomas Yates*, of 1, John-street, Cambridge-heath, Hackney, for a moveable ash-pan for fire-places, with parallel bars for separating the cinders from the ashes.

17. *W. C. Wilkins & M. S. Kendrick*, of Long-acre, for the "Carcel spirit meteor lamp."

18. *Henry Holland*, of 160, Darwin-street, Birmingham, for a spring for the runner of an umbrella or parasol.

20. *J. Dixon & Sons*, of Hatton-garden, for a watch protector.

20. *Stevens & Son*, of Darlington Foundry, Southwark-bridge-road, London, for the semaphore signals for railways.

21. *Francis Nalder*, of 41, Cheapside, London, for a glove.

24. *Brookes Hugh Bullock*, of No. 2, Chester-street, Grosvenor-place, Middlesex, for a distance measurer, for maps, charts, &c.

List of Disclaimers

OF PARTS OF INVENTIONS AND Amendments

Memorandum of alteration to specification of patent granted to Thomas Hancock, late of Goswell-mews, but now of Stoke Newington, Esq., for an improvement or improvements in the preparation or manufacture of caoutchouc in combination with other substances, which preparation or manufacture is suitable for rendering leather, cloth, and other fabrics waterproof, and to various other purposes for which caoutchouc is employed. Dated 21st November, 1843.—Filed 15th October, 1845.

List of Patents

Granted for SCOTLAND, subsequent to September 22nd, 1845.

To Charles Murland, of Castlewellan, flax spinner, and Edward Lawson, of Leeds, machine-maker, for certain improvements in machinery for preparing and spinning flax and other fibrous substances.—Sealed 23rd September.

John Kershaw, of Ramsbottom, in the county of Lancaster, cotton-spinner, for certain improvements in machinery or apparatus used in the preparation of cotton or other fibrous substances.—Sealed 24th September.

Joseph François Laubereau, of Paris, for improvements in obtaining power.—Sealed 24th September.

Charles Pooley, of Chorlton-upon-Medlock, cotton-spinner, for improvements in certain machines used in preparing to be spun and in spinning cotton, wool, and other fibrous substances.—Sealed 24th September.

Moses Poole, of London, Gent., for improvements in rails for railways,—being a foreign communication.—Sealed 24th September.

Bennet Woodcroft, of Manchester, engineer, for an improvement in propelling vessels.—Sealed 24th September.

William Cormack, of Dalglish-street, Commercial-road, London, chemist, for improvements in purifying gas.—Sealed 24th September.

James Taylor, of Lochwinnoch, Renfrewshire, carpet and rug manufacturer, for certain improvements in the manufacture of rugs, carpets, and other piled fabrics.—Sealed 25th September.

James Murray, residing at Garnkirk, Lanarkshire, partner of and acting for his co-partners of the Garnkirk Coal Company, for certain improvements in the manufacture of bricks, tiles, pipes, or other articles made of ground or pulverized fire-clay, or other clay, by pressure.—Sealed 1st October.

Samuel Knight, of Spotland, near Rochdale, bleacher, for certain improvements in machinery or apparatus for scouring, washing, cleansing, and other similar purposes.—Sealed 2nd October.

William Broughton, of New Basinghall-street, London, millwright, for improvements in machinery or apparatus for grinding grain, drugs, colors, or other substances.—Sealed 2nd October.

Dominic Frick Albert, of Manchester, consulting manufacturing chemist, Doctor of Laws, for a certain improved application of materials to the manufacture of soap.—Sealed 2nd October.

William Henry Ritchie, of Lincoln's Inn, London, Gent., for improvements in carding-engines,—being a foreign communication.—Sealed 2nd October.

James Knowles, Jun., of Bolton-le-Moors, county of Lancashire, coal merchant, and Alonzo Buonaparte Woodcock, of Manchester, engineer, for certain improvements in machinery or apparatus to be employed for raising coal or other matters from mines; which improvements are also applicable to raising or lowering men or animals, or other similar purposes.—Sealed 6th October.

John Mercer, of Oakenshaw, county of Lancaster, calico printer, and John Barnes and John Greenwood, of Church, same county, manufacturing chemists, for certain improvements in the manufacture of certain chemical agents used in dyeing and printing cottons, woollens, and other fabrics.—Sealed 7th October.

William Henry Fox Talbot, of Lacock Abbey, Chippenham, for improvements in obtaining motive power, and in the application of motive power to railways.—Sealed 7th October.

William Sykes Ward, of Leathley Lodge, Hunslet-lane, Leeds, for improvements in exhausting air from tubes or vessels, for the purpose of working atmospheric railways.—Sealed 7th October.

Dalrymple Crawford, of Stratford-on-Avon, county of Warwick, for an improved dibbling machine.—Sealed 7th October.

Paul Ackerman, Doctor of Medicine, 1, Skinner's-place, Size-lane, London, for certain improvements in harpoons and other similar instruments.—Sealed 9th October.

Giacomo Silvestri, Doctor of Medicine, of 87, Piccadilly, London, for certain improvements for the conservation of animal or vegetable organic matter.—Sealed 9th October.

Stephen Hutchison, of the London Gas Works, Vauxhall, London, engineer, for certain improvements in gas-meters.—Sealed 9th October.

Richard Archibald Brooman, of 166, Fleet-street, London, for a thread made from a substance not hitherto applied for that purpose; and also the application of it to the manufacture of piece goods, ribbands, paper, and other articles,—being a foreign communication.—Sealed 10th October.

William Henry Stevenson, of Nottingham, merchant, for certain improvements in machinery or apparatus to be used in dyeing or staining,—being a foreign communication.—Sealed 14th October.

Henry Grissell and James Lewis Lane, of the Regent's Canal, engineers, for certain improvements in weighing-machines, and also in steelyards.—Sealed 14th October.

Frederick Rosenborg, of the Borough of Kingston-upon-Hull, and John Malam, also of the same place, for certain improvements in apparatus for watering, manuring, and drying trees, plants, seeds, and roots; and for accelerating and improving the growth and produce of trees, plants, seeds, and roots,—Sealed 16th October.

New Patents

SEALED IN ENGLAND.

1845.

To Alexander Bain, of Hanover-street, Edinburgh, engineer, for improvements in electric clocks and telegraphs, part of which improvements are applicable for other purposes. Sealed 25th September—6 months for inrolment.

Alfred Vincent Newton, of the Office for Patents, 66, Chancery-lane, mechanical draughtsman, for certain improvements in machinery for manufacturing screws,—being a communication. Sealed 26th September—6 months for inrolment.

Alfred Vincent Newton, of the Office for Patents, 66, Chancery-lane, mechanical draughtsman, for certain improvements in machinery for manufacturing metal pipes or tubes,—being a communication. Sealed 26th September—6 months for inrolment.

John Reed Hill, of 28, Stamford-street, Lambeth, civil engineer, for certain improvements in atmospheric propulsion, applicable to water as well as land carriage,—being a communication. Sealed 2nd October—6 months for inrolment.

George Roberts, of Wells-street, Cripplegate, miner, for certain improvements in the construction of lamps for illumination. Sealed 2nd October—6 months for inrolment.

John Kershaw, of Ramsbottom, in the county of Lancaster, cotton spinner, for certain improvements in machinery or apparatus used in the preparation of cotton or other fibrous substances for spinning. Sealed 2nd October—6 months for inrolment.

Frederic Rosenborg, of Kingston-upon-Hull, Gent., and John Malam, of the same place, gas manufacturer, for certain improvements in, or apparatus for, watering, manuring, and drying trees, plants, seeds, and roots; and for accelerating and improving the growth and produce of trees, plants, seeds, and roots. Sealed 2nd October—6 months for inrolment.

Alfred Hall, of Coxsackie, America, brick maker, for certain improvements in machinery or apparatus for making, moulding, or manufacturing bricks, tiles, and other articles, from earthy or plastic materials. Sealed 2nd October—6 months for inrolment.

George Daniel Bishopp, of Edgbaston, in the county of Warwick, civil engineer, for improvements in certain engines or machines used for obtaining mechanical power, and for raising and impelling fluids. Sealed 2nd October—6 months for inrolment.

Robert Clark, of Newburgh, ship painter, and Alexander Pirnie, of the same place, ship's smith, for certain improvements in steering vessels. Sealed 2nd October—6 months for inrolment.

John Simpson, of Langton Rectory, York, clerk, for certain improvements in obtaining and applying motive power. Sealed 2nd October—6 months for inrolment.

John Hale, of Leicester-square, Middlesex, Esq., for certain improvements in guns. Sealed 2nd October—6 months for inrolment.

Graziano Conté, of Regent-street, Middlesex, merchant, for improvements in machinery for cutting, carving, and sculpturing marble, stone, wood, and other like substances,—being a communication. Sealed 3rd October—6 months for inrolment.

Moses Poole, of the Patent Bill Office, London, Gent., for improvements in rails for railways,—being a communication. Sealed 6th October—6 months for inrolment.

Gabriel Hippolyte Moreau, residing at No. 18, Boulevart Bonne Nouville, Paris, Gent., for an improved steam-carriage. Sealed 6th October—6 months for inrolment.

Augustus Julien Van Oost, of Genbruge, near Ghent, but now of Osnaburgh-street, Regent's Park, for improvements in treating seed, and in preparing materials used for fertilizing land, and for aiding vegetation. Sealed 6th October—6 months for inrolment.

Thomas Russell Crampton, of Southwark-square, Surrey, engineer, for improvements in locomotive engines and railways. Sealed 6th October—6 months for inrolment.

Thomas Howard, of the King and Queen Iron Works, Rotherhithe, Surrey, iron manufacturer, for improvements in rolling iron bars for suspension bridges and other purposes. Sealed 6th October—6 months for inrolment.

Joseph Quick, of Sumner-street, Southwark, engineer, for improvements in steam-engines. Sealed 9th October—6 months for inrolment.

John Lake, of Apsley, Herts, civil engineer, for certain improvements in propelling. Sealed 9th October—6 months for inrolment.

Isaac Hartes, of Rosedale Abbey, York, farmer, for certain improvements in machines or machinery, for rowing, sowing, and manuring land. Sealed 9th October—6 months for inrolment.

Edmund Morewood, of Thornbridge, Derby, merchant, and George Rogers, of Stearndale, in the same county, Gent., for im-

provements in the manufacture of iron into sheets, plates, or other forms; in coating iron, and in preparing iron for coating and other purposes. Sealed 9th October—6 months for inrolment.

Alexander Parkes, of Birmingham, artist, for improvements in coating or covering certain metals with other metals and metallic alloys, and for ornamenting the surfaces of various metallio articles. Sealed 9th October—6 months for inrolment.

Thomas Wood Gray, of Workworth-terrace, Commercial-road, plumber, for improvements in ports, and apparatus for opening and closing ports of ships or other vessels; also applicable in opening and closing windows, and other instruments having the like movements. Sealed 9th October—6 months for inrolment.

Henry Francis, of Wardour-street, civil engineer, for improvements in the manufacture of gas. Sealed 9th October—6 months for inrolment.

Edmund Morgan, of Tenby, Pembrokeshire, Gent., for an improved envelope for letters. Sealed 9th October—6 months for inrolment.

Edward Patrick Emerson, of the City of Dublin, doctor of medicine, for improvements in the manufacture of paints, pigments, cements, and other plastic compositions, and in the machinery or apparatus to be used in such manufacture; parts of which improvements are also applicable to the manufacture of artificial stone and marble. Sealed 9th October—6 months for inrolment.

Thomas Hollingsworth, of Birmingham, cigar merchant, for a certain improvement or certain improvements in the construction of cases for holding cigars. Sealed 9th October—6 months for inrolment.

Joseph Edward Judson, of Ashton-under-Lyne, saddler, and Edward Banton, of Walsall, Staffordshire, commercial traveller, for a certain improvement or certain improvements in covering rollers used in spinning cotton and other threads; also in covering mill-straps. Sealed 9th October—6 months for inrolment.

David Wilkinson, of Potters' Pury, near Stoney Stratford, Gent., for improvements in obtaining motive power. Sealed 10th October—6 months for inrolment.

Edward Lesley Walker, of Foley-place, Middlesex, professor of music, for improvements in piano-fortes. Sealed 10th October—6 months for inrolment.

Joseph Clisild Daniell, of Tiverton Mills, Bath, clothier, for improvements in dressing and finishing woollen and other cloths. Sealed 10th October—6 months for inrolment.

George Fergusson Wilson, of Belmont, Vauxhall, Gent., George Gwynne, of Putney, Gent., and James Pillans Wilson, of Belmont, aforesaid, Gent., for improvements in the manufacture of soap. Sealed 10th October—6 months for inrolment.

Alexander Jamieson and John Frederick Lundholm, of Tothill-street, Westminster, manufacturing chemists, for improvements in dressing ores requiring washing. Sealed 10th October—6 months for inrolment.

John Whitehead, of Leeds, for improvements in machinery for combing, hackling, and straightening wool, flax, tow, and other fibrous substances. Sealed 10th October—6 months for inrolment.

Frederick Harlow, of Paradise-street, Rotherhithe, carpenter, for improvements in atmospheric railways. Sealed 10th October—6 months for inrolment.

Charles Nossiter, of Lyndon End, near Birmingham, for improvements in the manufacture of leather. Sealed 10th October—6 months for inrolment.

James Hardcastle, of Firwood, Bolton-le-Moors, Lancashire, Esq., for certain improvements in the method of conveying water. Sealed 10th October—6 months for inrolment.

Charles Hanson, of Huddersfield, watchmaker, for certain improvements in clocks, watches, or time-keepers. Sealed 10th October—6 months for inrolment.

James Knowles, Jun., of Bolton-le-Moors, coal-merchant, and Alonzo Buonaparte Woodcock, of Manchester, engineer, for certain improvements in machinery or apparatus to be employed for raising coal or other matters from mines, which improvements are also applicable to raising or lowering men or animals, or other similar purposes. Sealed 10th October—6 months for inrolment.

William Hodgson Gratrix, of Nuneaton, Warwickshire, ribbon weaver, for certain improvements in looms for weaving ribbons and other fabrics. Sealed 10th October—6 months for inrolment.

James Taylor, of Lochwinnoch, Renfrewshire, carpet and rug manufacturer, for certain improvements in the manufacture of carpets, rugs, and piled fabrics. Sealed 10th October—6 months for inrolment.

Edmund Barber, of Tring, decorative painter, for certain improvements in graining and decorating in oil, distemper, and other colours, and in imitating marbles, granites, fancy and other woods, and in the apparatus and instruments to be used therein. Sealed 11th October—6 months for inrolment.

Benjamin West, of St. John's Walk, Clerkenwell, book-binder, for certain improvements in covering or stoppering the tops of bottles, jars, pots, and other similar vessels. Sealed 16th October—6 months for inrolment.

Stephen Reed, of the town of Newcastle-upon-Tyne, Gent., for certain improvements in railway rails and chairs. Sealed 16th October—6 months for inrolment.

William Elliott, of Birmingham, button manufacturer, for improvements in the manufacture of buttons. Sealed 16th October—6 months for inrolment.

John Barsham, of Long Melford, Suffolk, manufacturer of bitumen, for improvements in the manufacture of mattresses, cushions, brushes, and brooms, and in machinery for preparing certain materials applicable to such purposes. Sealed 16th October—6 months for inrolment.

John Marshall, of Southampton-street, Strand, tea-dealer, for improvements in preparing cocoa and chocolate. Sealed 16th October—6 months for inrolment.

William Betts, of Smithfield Bars, distiller, for improvements in the manufacture of brandy, gin, and rum, and other British spirits and compounds. Sealed 16th October—6 months for inrolment.

James Webster Hale, of Fitzroy-square, Gent., for improvements in machinery for cleaning or freeing wool, and certain other fibrous materials, of burrs and other extraneous substances. Sealed 16th October—6 months for inrolment; being a communication.

Hippolyte Pierre François Desgranges, of Skinner's-place, Sise-lane, London, Gent., for an improvement or improvements in the mode of manufacturing corks. Sealed 17th October—6 months for inrolment.

William Henry Stevenson, of the town and county of Nottingham, merchant, for certain improvements in machinery or apparatus to be used in dyeing or staining,—being a communication. Sealed 23rd October—6 months for inrolment.

Joseph Orsi, of Pimlico, Gent., for improvements in sleepers or blocks for supporting railways. Sealed 23rd October—6 months for inrolment.

Thomas Taylor, of Manchester, cabinet maker, for certain improvements applicable to machinery or apparatus employed for sawing timber. Sealed 23rd October—6 months for inrolment.

Thomas Worsdell, Jun., of Stratford, railway carriage builder, for certain improvements in apparatus to be attached to, and employed in connection with, railway carriages. Sealed 23rd October—6 months for inrolment.

Arthur Smith, of St. Helen's, Lancashire, manufacturing chemist, for certain improvements in the manufacture of soda ash. Sealed 23rd October—6 months for inrolments.

William Coles Fuller, of Brownlow-street, Holborn, for improvements in the construction of carriages for railways. Sealed 23rd October—6 months for inrolment.

William Thomas, of the city of London, merchant, for certain improvements in the construction of umbrellas and parasols,—being a communication. Sealed 24th October—6 months for inrolment.

John Davies, of Manchester, patent agent, for certain improvements in the method of dyeing or staining woven or piece-goods or fabrics, and in the machinery or apparatus to be used for such or similar operations.,—being a communication. Sealed 25th October—6 months for inrolment.

CELESTIAL PHENOMENA for November, 1845.

D	H.	M.	
1			Clock after the sun, 16m. 17s.
	—		☽ rises 8h. 40m. M.
	—		☽ passes mer. 1h. 7m. A.
	—		☽ sets 5h. 31m. A.
2	15	44	♀ in conj. with the ☽ diff. of dec. 5. 27. S.
	2	21	☽ in Apogee
3			Occul. 16 Sagittarii, im. 6h. 53m. em. 7h. 53m.
			Occul. ν2 Sagittarii, im. 7h. 6m. em. 7h. 24m.
4	14	4	♃'s first sat. will em.
4	15	35	♄ in □ with the ☉
5			Clock after the sun 16m. 15s.
	—		☽ rises 0h. 19m. A.
	—		☽ passes mer. 5h. 3m. A.
	—		☽ sets 9h. 53m. A.
6	6	15	☽ in □ or first quarter
	8	32	♃'s first sat. will em.
6	6	49	♄ in conj. with the ☽ diff. of dec. 6. 40. S.
7	23	17	♂ in conj. with the ☽ diff. of dec. 7. 19. S.
9			Occul. λ Piscium, im. 3h. 10m. em. 4h. 1m.
			Occul. 22 Piscium, im. 9h. 5m. em. 10h. 15m.
9	21	12	☿ in Aphelion
10			Clock after the sun, 15m. 54s.
	—		☽ rises 2h. 35m. A.
	—		☽ passes mer. 9h. 15m. A.
	—		☽ sets 2h. 55m. M.
10			Occul. δ Piscium, im. 12h. 46m.
10	5	3	♅ in conj. with the ☽ diff. of dec. 4. 20. S.
	11	55	♃'s second sat. will em.
11	15	59	♃'s first sat. will em.
12	5	15	♃ in conj. with the ☽ diff. of dec. 2. 40. S.
	15	19	♀ greatest hel. lat. S.
13			Partial Eclipse of the Moon.
	9	57	First contact with the Penumbra.
	11	10	First contact with the Shadow.
	12	49	Middle of the Eclipse.
	14	28	Last contact with the Shadow.
	15	41	Last contact with the Penumbra.
14	0	55	Ecliptic oppo. or ○ full moon
16			Occul. ε Tauri, im. 18h. 22m. em. 19h. 6m.
			Occul. χ2 Orionis, im. 8h. 19m.
	17	39	Ceres in □ with the ☉
			Mercury R. A. 16h. 20m. dec. 23. 16. S.
17	—		Venus R. A. 18h. 42m. dec. 25. 45. S.
	—		Mars R. A. 22h. 48m. dec. 9. 10. S.
	—		Vesta R. A. 4h. 51m. dec 15 36. N.
	—		Juno R. A. 13h. 42m. dec. 5. 42. S.
	—		Pallas R. A. 20h. 15m. dec. 1. 19. S.
	—		Ceres R. A. 22h. 4m. dec. 23. 46. S.
	—		Jupiter R. A. 2h. 6m. dec. 11. 17. N.
	—		Saturn R. A. 21h. 3m. dec. 17. 56. S.
	—		Georg. R. A. 0h. 25m. dec. 1. 59. N.
	—		Mercury passes mer. 0h. 35m.
	—		Venus passes mer. 2h. 57m.
	—		Mars passes mer. 7h. 2m.
	—		Jupiter passes mer. 10h. 18m.
	—		Saturn passes mer. 5h. 17m.
	—		Georg. passes mer. 8h. 38m.
17	14	31	♃'s second sat. will em.
18	21		☽ in Apogee
20	12	23	♃'s first sat. will em.
20			Clock after the sun, 14m. 10s.
	—		☽ rises 10h. 6m. A.
	—		☽ passes mer. 4h. 32m. M.
	—		☽ sets 11h. 48m. M.
	12	43	♃'s third sat. will im.
	14	48	♃'s third sat. will em.
22	4	26	☽ in □ or last quarter
	6	52	♃'s first sat. will em.
			Occul. ν Leonis, im. 16h. 53m.
25			Clock after the ☉ 12m. 47s.
	—		☽ rises 2h. 33m. M.
	—		☽ passes mer. 8h. 13m. M.
	—		☽ sets 1h. 42m. A.
27	14	18	♃'s first sat. will em.
29	8	47	♃'s first sat. will em.
29	11	41	Ecliptic conj. or ● new moon
30			Clock after the sun, 11m. 26s.
	—		☽ rises 7h. 29m. M.
	—		☽ passes mer. 11h. 50m. M.
	—		☽ sets 4h. 9m. A.
	7	23	☿ in conj. with the ☽ diff. of dec. 5. 47. S.
30	8	16	☿ greatest hel. lat. S.
	18		☽ in Perigee

J. LEWTHWAITE, Rotherhithe.

THE

LONDON JOURNAL,

AND

REPERTORY

OF

Arts, Sciences, and Manufactures.

CONJOINED SERIES.

No. CLXVIII.

RECENT PATENTS.

To William Schnebly, *of Lambeth, in the county of Surrey, engineer, for his invention of certain improvements in machinery for letter-press or surface printing.*—[Sealed 21st January, 1845.]

These improvements relate to that description of press or printing machine in which the impression is made by means of a flat surface or platen, instead of employing a cylinder, as is ordinarily the case in printing machines, actuated by steam or other motive power. In this improved printing machine the form of type is placed on a table immediately beneath the platen, which is stationary, and, in order to make the impression, the form is raised up by a knee or toggle-joint, against the under surface of the platen. The inking operation is performed by carrying the inking rollers over the form of type, which always remains beneath the platen.

Fig. 1, Plate XIII., represents a side elevation of the machine complete; fig. 2, is a plan view, as seen from above,—the board on which the paper to be printed is placed being removed, so that the parts below may be more clearly seen fig. 3, represents a transverse section of the machine; and

fig. 4, some of the parts detached. The frame-work of the machine is made of cast-iron, and is shewn at *a, a, a.* *b,* is the main driving shaft, on which the ink-roller or cylinder *c, c,* is mounted; and it also carries the driving-pinion *d,* and fly-wheel *e, e.* The machine is actuated either by steam power driving a band-wheel or pulley on the main-shaft, or by means of a winch-handle attached to the fly-wheel, as shewn in the drawing. *f,* is a large toothed-wheel mounted in bearings attached to the frame-work, and driven by the pinion *d.* This wheel *f,* has an excentric groove *g, g,* formed therein, or attached thereto, and, by means of the large vibrating levers *h,* and *i,* communicates motion to various working parts of the machine. The form of type is placed on a table *j,* shewn by dots in fig. 1, and which has grooves made on its under side, and is mounted on an elevating frame, furnished with rails *k, k, k,* on which the grooves of the table slide, and whereby the latter, with the form of type thereon, may be easily moved into or out of the machine, at the side thereof, when required. The tympan-frame is attached to the under side of the platen, and supported by ears, which allow of its being slidden in and out of the machine, in a similar manner to the table. By thus being enabled to remove the table, with the form of type, out of the machine, the type may be got at with great facility for alterations or corrections. The elevating frame *k, k,* is raised by means of the knee or toggle-joint *l, l,* which at one end is connected thereto, and at the lower end is attached to a cross-piece, which forms part of the framing, as shewn at fig. 3.

In order that the frame and table may be raised in a perfectly horizontal position, vertical rods *m, m,* are connected to the under part of the elevating frame, and made to slide up and down the bearings m^*, m^*, m^*, which are firmly bolted to the framing, as shewn at fig. 3. The platen *n, n,* in this machine, is stationary, and is firmly fixed on the top of four columns or supports n^*, n^*, n^*, which rise from near the centre part of the framing, and it is further secured by cross-braces n^1, n^1, below.

The paper to be printed is placed on the inclined board *o, o,* fig. 1, immediately above the platen, and is fed in by a

boy, who brings it forward, sheet by sheet, in the ordinary manner. The edge of each sheet is placed between the jaws of the nippers *p*, *p*, figs. 1, 2, and 4, which are mounted on a rod, as seen in the plan view. This rod is connected at each end to an endless band *q*, *q*, which band passes over the roller *r*, and pulleys *s*, *s*, and under the platen, and, by means of the nippers before mentioned, carries in the sheet of paper, which is supported against the under side of the platen by means of strings or tapes, as is well understood, and is shewn in the detached view, fig. 4. The endless bands *q*, *q*, and strings or tapes for supporting the paper, are actuated by the travelling frame *t*, *t*, shewn detached at fig. 4. This frame runs upon and between antifriction rollers, which are fixed to the framing, as seen in fig. 3, and carries the two inking-rollers *u*, *u*, which supply the form with ink. The endless bands *q*, *q*, are connected to each side of the travelling frame by the arms *t**, figs. 1, and 4, which consequently cause the band, with the nippers affixed thereto, to travel to and fro under the platen. In fig. 5, a mode of constructing and arranging this part of the machine is shewn, whereby the paper is introduced into the machine without being doubled back or bent far out of the straight line. In this figure the board *o*, *o*, instead of being placed above the platen, as in fig. 1, is situated over one end of the framing. The sheet of paper is pushed forward by the attendant, to a certain mark, where it is laid hold of by a system of nippers or jaws, connected to the travelling frame *t*, *t*. A horizontal rod *p*, extends across the machine, and is furnished with a number of fixed fingers or nippers; and *p**, is another horizontal rod, which turns on a centre, and is also furnished with fingers, which turn with it. At each end of the rod *p**, is situated a small lever p^2, which, as the travelling frame *t*, *t*, is drawn out of the machine, comes in contact with a stud or inclined piece p^3, and thereby opens the jaws to receive the blank sheet of paper; and by the frame *t*, *t*, continuing to advance, the levers p^2, will pass the under side of the stud p^3, and the fingers or nippers will consequently close upon the sheet of paper; and when the travelling-frame *t*, *t*, enters the machine, the lever p^2, will pass over the stud p^3, and the nippers will carry i

the sheet of paper with them. q^*, q^*, is a system of cords or tapes attached to the travelling-frame, for the purpose of supporting and carrying in the sheet. These cords pass over pulleys *r*, *r*, and when the travelling-frame comes out of the machine with the printed sheet, this latter passes under the board *o*, *o*, over the pulleys *r*, *r*, and on to the endless cords *s*, *s*, from which it is transferred on to the vibrating-frame. It will be understood, that when the frame *t*, *t*, with its printed sheet, comes out of the machine, the sheet is liberated by the jaws *p*, *p*, being opened by the lever p^2, coming into contact with the stud p^3, before mentioned. The travelling-frame *t*, *t*, is actuated by a vibrating lever *v*, keyed on to the horizontal shaft *w*, which also carries at its end a short lever w^*. This lever w^*, is actuated by the large vibrating lever *h*, through the intervention of the connecting-rod *x*. The lever *h*, and also the lever *i*, carry at their upper ends antifriction rollers, which work in the groove *g*, *g*, of the large wheel *f*, *f*; and as this wheel rotates, and carries with it the excentric groove *g*, *g*, the levers *h*, and *i*, are caused to vibrate on their fulcrums. It will now be evident, that when the smaller radius of the groove comes round, it will draw back the upper end of the lever *h*, pulling with it the levers w^*, and *v*, and by that means force inwards the travelling-frame *t*, *t*, and carry the inking or distributing rollers *u*, *u*, over the face of the type. While this is being effected, the table, with the form of type thereon, is in its lowest position, and as the sheet of paper is being brought under the platen, the wheel *f*, with its groove, continuing to revolve, will draw back the upper end of the lever *i*, and likewise the upper end of a lever *z*, to which it is connected by the rod *y*. This lever *z*, is mounted on the end of a shaft, which carries at its centre another lever 1, connected by means of a rod 2, to the toggle or knee-joint *l*, *l*, shewn behind the centre support of the framing by dots in fig. 1, and in elevation at fig. 3. The lower end of this joint is supported on the beam 4, and its upper end is connected to the bed-plate or elevating frame, on which the form of type is placed; and consequently when the toggle or knee-joint is straightened, the form of type on the bed-plate is forced up against the under side of the platen, by which means the impression is given.

The small rollers 6, 6, in fig. 4, represent the rollers to which the tapes or strings, which carry the paper, are fastened; the two small rollers 7, 7, are fastened to the framing, and are caused to rotate by the friction of contact of the tapes, while the frame *t*, *t*, is run in and out. When the impression has been given to the paper, and the travelling-frame goes in to supply the type with ink, and draw in another sheet, it carries back the endless bands *q*, and the nippers connected thereto, and at the same time it carries back the tapes that support the printed sheet, and which are attached to the pulleys 6, 6. As the printed sheet issues from the machine it passes over the pulleys 7, 7, figs. 1, and 4, and is deposited upon a light framing 8, 8, consisting of a number of laths and a series of pulleys, with endless tapes distended across them. It should be understood, that all the while that the sheet is in the machine, and under the platen, the nippers of the endless band *q*, keep hold of one edge of it; but when it is carried out of the machine, the jaws of the nippers, as they pass along, are opened by a stud or trigger, affixed to the frame-work, acting against the end of the rod which carries them. The printed sheet is then released, and allowed to fall on to the pulley-framing 8, 8, before mentioned. In figs. 1, and 2, the vibrating-framing 12, 12, is represented as having deposited one printed sheet on to the pile, on the table 9, and as about to return for another. This framing is mounted on a centre in bearings, at 10, and describes an arc, as shewn by dots in figs. 1, and 5, when delivering a sheet. It is actuated by a sector-rack 11, which gears into a wheel 10, mounted on the end of a horizontal shaft, furnished with a number of long light laths or fingers 12, 12, as seen best in the plan view fig. 2, and on to which the sheet is delivered as before mentioned. A vibrating or reciprocating motion is communicated to the sector-rack, and consequently to the wheel 10, and its framing 12, 12, by means of the lever *z*, to the upper end of which the sector-rack is connected, as seen in figs. 1, and 5. The framing 8, 8, consists of a series of pulleys, mounted loosely on shafts at each end, and over these pulleys endless bands, straps, or tapes, are distended, and are set in motion by means of a band, passing from a rigger on the

main axle, or any other convenient part of the machine, over a small driving-pulley on the axle of the framing.

It will now be understood, that in order to receive the printed sheet of paper from the machine, the vibrating-frame 12, 12, is brought over, as before mentioned, into the position shewn by dots in the drawing; and that while the printed sheet is issuing from the machine on to the framing, the tapes of the framing 8, 8, are kept in motion, and carry the sheet forward to a stop-piece 8*, at the other end of the vibrating-frame 12; this frame is then turned over by the mechanical arrangements above described, and the printed sheet is accurately piled on the table with the printed surface upwards.

The table 9, on which the printed sheets are piled, is mounted on a screwed shaft 3, which passes through a horizontal block 13, to the under side of which a ratchet-wheel is attached, as seen in fig. 1. The table is kept steady and in a perfectly horizontal position by the guide-rods 15, 15; and the ratchet-wheel 13, is pushed round by means of a rod 14, connected to the lever *z*; and every time this lever is forced back into the position shewn by dots in fig. 1, it forces round the ratchet-wheel 13, and by that means causes the table to descend a sufficient space, according to the thickness of the paper. By this means the assistance of any person to receive and pile the printed sheets is dispensed with. When the required number of sheets has been printed, they are removed from the table, which is then raised, by means of the handle 16, to its greatest elevation, to receive a fresh supply.

The inking apparatus is worked by an excentric 17, on the axle of the large wheel *f*, *f*, as shewn in the plan view, fig. 2. This excentric is connected to the inking apparatus by the rod 18, one end of which is jointed to the elbow-lever 19, at the upper end of the vertical shaft 20, which turns in bearings fixed in the frame-work. The ink trough or reservoir is seen at 21, fig. 1. It is furnished with a supplying-roller, which is partially immersed in the ink, and on the axle of which a ratchet-wheel 22, is mounted. This wheel is caused to revolve by the pall or click 23, which is jointed to the end of a lever

or arm extending from the vertical rod 20. It will therefore be obvious that when this shaft 20, is made to turn horizontally on its axis, it will, by means of the pall 23, force round the ratchet-wheel 22, and thereby cause the supplying-roller to turn slowly on its axis. A distributing-roller is mounted at the end of a vibrating-lever 24, which turns on a centre, as shewn by dots in the drawing, and is worked by the excentric 17, or in any other convenient manner; whereby it is alternately brought into contact, first with the supplying-roller in the trough, and then with the under side of the large inking-cylinder, as is well understood, and is usual in these cases, and therefore constitutes no part of the improvements. When a sufficient quantity of ink has been, by this means, supplied to the large cylinder, it must be equally distributed over its surface; and this object is effected by means of the distributing-roller 25, which is mounted in bearings in the frame-work, and is caused to revolve by its contact with the large ink-cylinder. In order that the ink may be properly distributed, and prevented from accumulating on those parts of the inking-rollers which do not come in contact with the type of the form, a lateral motion is imparted to the distributing-roller 25; which is effected by means of an arm 26, extending horizontally from the upper end of the vertical shaft 20; and, as this latter is forced round, it shogs or forces sideways the distributing-roller 25.

The patentee's claims are as follows: "First,—the arrangement or disposition of the various parts of the machine, as shewn in the drawings, whereby I am enabled to place all those parts which effect the several movements of the machine on one side. Second,—I claim the employment of a grooved wheel, similar to the wheel *f*, in conjunction with the levers *h*, and *i*, whereby I effect the operation of pressing, and the reciprocating movement of the travelling-frame; and by the employment of which grooved wheel, the machine may be driven in either direction, and will produce the same results without any liability to derangement.—I also claim the employment of antifriction rollers, on which the travelling-frame is made to run. Third,—I claim the peculiar mode of mounting the bed-plate on the elevating frame, whereby the said bed-plate, with the form of type thereon, may be easily

drawn sideways out of the machine, when required. Fourth,—I claim carrying in the sheet of paper (to be printed) by means of nippers or holders, connected with chains or straps, as above described; and also the employment of the cords or tapes (connected to the travelling-frame) which bear up the paper from the form of type, independent of the frisket, and carry the printed sheet out of the machine on to the receiving-frame s, s.—I also claim the method of carrying the paper into the machine from a board, situated over the end of the frame, as shewn in fig. 5. Fifth,—I claim the mode of, and apparatus for, receiving and piling the printed sheets on a self-adjusting table, as shewn.—I claim the exclusive right to use a self-adjusting table, in whatever way the same may be actuated; and also the mode of working the same. Sixth,—I claim the peculiar arrangement of the inking-apparatus."—[*Inrolled in the Petty Bag Office, July,* 1845.]

Specification drawn by Messrs. Newton and Son.

To Constant Champion, *of the city of London, merchant, for an invention of improvements in burning animal charcoal,—being a communication.*—[Sealed 17th March, 1845.]

In order to burn or revivify animal charcoal, after its bleaching properties have been exhausted by operating upon unclarified syrups, it has generally been the course to place the charcoal that requires burning or revivifying in large iron retorts, and then expose it to the heat of a furnace, until the charcoal is sufficiently burned, or its bleaching properties revivified, when it is withdrawn, and allowed to cool in close vessels, and a fresh charge substituted in place of the one just operated upon. It has also been proposed to withdraw the charge gradually, or in small quantities at a time, from the lower end of the retort, keeping the retort filled, by adding fresh charcoal at the upper end, as that operated upon is withdrawn from the lower. Experience, however, having proved that it is impossible to burn or revivify animal charcoal in a perfect manner by operating upon large quantities at a time, the inventor has applied himself to find out some simple and economical means of operating upon small quantities of not more than one-hundred-weight at once, or rather

upon large quantities, so sub-divided in the apparatus, that every particle may be duly and properly operated upon by the heat; and also of acting upon them with the greatest possible heat. To effect these objects, he has invented the apparatus shewn in Plate XIV., in which fig. 1, is a longitudinal vertical section of the improved apparatus, taken in the line I, K, of fig. 2; which figure represents a horizontal section of the apparatus, taken in the lines A, B, C, D, of fig. 1. Figs. 3, and 4, are transverse vertical sections, taken respectively in the lines E, F, and G, H, of fig. 2. *a, a,* are tubes or pipes of very small diameters, and made of refractory earth, or fire-clay, or some other substance, capable of resisting any degree of heat, and may be composed of several sections luted together, These tubes are mounted vertically in a chamber or oven *o, o,* in which they are acted upon by the heat and flames of a furnace or fire-place *i, i.* *b, b,* are cast-iron shoes, sockets, or vessels, which receive the ends of the pipes *a.* These vessels are closed at bottom by valves *c, c,* which are opened and closed by means of the rods *d, d,* and the cranks *e, e, e.* *f,* is a cast-iron plate, serving to support the pipes and the shoes, sockets, or vessels *b*; and f^1, is a similar cast-iron plate, which supports the upper ends of the pipes or tubes *a, a,* and is also intended to receive the charcoal before it enters the pipes *a, a.* *g, g,* are large fire-tiles, made of refractory earth or fire-clay, which serve to close the chamber or oven *o, o,* and preserve the cast-iron plates from the action of the fire. *h,* is a flue or passage, for the admission of flame and heat to the chamber or oven which contains the tubes *a, a*; and h^1, is the exit passage from the same to the horizontal flue underneath the drying-floor, and conducts the products of combustion from thence to the chimney. *i,* is the fire-place or furnace; *k, k,* is the drying-floor; *l,* is an inclined plane, upon which the burned charcoal falls when discharged from the tubes, and down which it slides, or is removed into the receptacle *m,* from whence it is carried to some place to cool in the open air; and *n,* is the open chimney at the other end of the apparatus.

The process of burning or revivification is effected as follows:—If the charcoal is to be revivified or re-burned, it is, after being washed, placed in a damp state at the end of the

drying-floor, furthest from the furnace, and is gradually moved towards the furnace. By this means, it is dried by the heat in the flue beneath the floor, and when the pipes are filled, they are thereby charged with well-dried charcoal; and in order to keep them well filled, the charcoal is piled up in a heap above the pipes, on the cast-iron floor f^1.

After the charcoal has been operated upon by a strong heat for from 12 to 15 minutes, a quantity of it is to be discharged from the pipes into the atmosphere, care being taken to stir it well to prevent it whitening. It is afterwards carried away to cool (the employment of water being dispensed with), and for this purpose it must not be heaped up too high. The fire must be kept at its greatest heat, and at an equal temperature, and a part of the charge drawn every 12 or 15 minutes.

When it is required to withdraw a portion of the charge, the lower end of the pipes *a, a,* are opened by turning down the valves *c, c,* by means of the handles or cranks *e, e;* and when the proper quantity has escaped from the pipes, the valves are closed: as there is always a supply of charcoal heaped up above, as before mentioned, the pipes are always kept filled.

An apparatus of a similar construction is employed for burning bones or manufacturing new charcoal, but it will be necessary to make the following modifications in the apparatus, viz.:—The number of pipes employed in an apparatus of the same dimensions is less, and the diameter of such pipes is increased. The other portions of the apparatus remain the same as if employed for revivifying, but to the top of the pipes or tubes, funnel-mouthed pipes are adapted, to allow of the escape of the gases and smoke arising from the charcoal, and to conduct them away either into the open air or into some apparatus where the ammonia may be extracted therefrom. These funnel-mouthed conducting tubes are constructed and arranged in such a manner that they may with facility be removed from the upper end of the vertical tubes, for the purpose of charging the tubes, and may with equal facility be re-applied.

The patentee claims, Firstly,—the general construction and

arrangement of the apparatus, as herein shewn. Secondly,—the use of pipes or tubes, made of fire-clay, or other analogous material, capable of sustaining a high degree of heat, such pipes or tubes being of small diameter, placed vertically in a chamber or oven, and closed at their lower extremities, as shewn. Thirdly,—the manner shewn and described of heating the pipes or tubes on all sides equally, by surrounding them with flame from one fire. Fourthly,—the arrangement, construction, and mode of working the valves *c*, *c*, for discharging the charcoal, one rod and handle being sufficient for four or five pipes. And, Lastly,—he claims, allowing the charcoal, in a red-hot state, to fall into the open air, where it is cooled without water, by being kept stirred while cooling, so as to prevent it from whitening.—[*Inrolled in the Petty Bag Office, September,* 1845.]

Specification drawn by Messrs. Newton and Son.

To Pryce Buckley Williames, *of Llegodig, in the county of Montgomery, North Wales, Gent., for his invention of certain improvements in the manufacture of artificial stone.*—[Sealed 17th March, 1845.]

The principal object of this invention is to manufacture an artificial stone of a material possessing the workable qualities and appearance of marble.

Various attempts have from time to time been made to produce an article that could be used for various purposes for which statuary and ornamental marbles are now employed; but the principal objection to their employment for the former purpose, viz., for statuary, is the impracticability of cutting or working them with a chisel, owing to their hardness or flinty nature. Other artificial marbles have been produced, which, from the softness of their nature and consequent want of durability, have been considered equally objectionable The artificial stone produced according to these improvements may be employed either for statuary purposes (when it is required to be a pure white), or, by veining and coloring it by the introduction of particular ingredients, as will be hereafter

described, it may be rendered more ornamental and applicable for such articles as chimney-pieces, slabs, monuments, tables, and other similar purposes, for which ornamental slabs are or may be employed

The material employed as the base of this artificial stone or composition is, sulphate of barytes, which must be finely pulverized and intimately mixed with some flux, also reduced to a fine impalpable powder. Fluxes of various descriptions, and in different proportions, may be employed in combination with the sulphate of barytes, according to the nature of the product required; but the flux preferred by the patentee is crown-glass, or its constituents, combined with a small proportion of borax. In order to produce a fair specimen of white marble, such as is required by statuaries, the following proportions will be found to give a very good result:—Take of sulphate of barytes four parts by weight, one part by weight of crown-glass, and add to this of dried borax about one-fourth the weight of the crown-glass. The composition of crown-glass will be found to vary in some degree according to the peculiar process adopted by different manufacturers; and as native sulphate of barytes sometimes contains small quantities of extraneous or foreign matters, it will be evident that the above proportions must occasionally be varied in some degree, according to these various circumstances; previously therefore to entering upon the manufacture of the improved composition or artificial stone, on an extensive scale, it would be advisable that a few preliminary experiments should be made in trial pots, so as to ascertain the quality of the materials that are intended to be employed. The above-mentioned materials must be reduced to a fine impalpable powder, and should be very intimately mixed together, in the proper proportions, while in a pulverized state; and then a convenient quantity, according to the nature of the article required, is placed in a covered vessel, trough, seggar, or pot, and introduced into a furnace, where it is to be submitted to a very intense heat, for the purpose of reducing the whole of the materials to a uniform mass, by fusing them all together. Any furnace that is employed in the manufacture of crown or flint glass will serve for the

production of the improved composition or artificial stone, but the patentee has shewn in the drawings accompanying his specification a furnace and appendages constructed expressly for making the artificial stone.

In Plate XIII., fig. 1, represents a vertical section taken through the middle of the furnace; fig. 2, is a horizontal section taken in the line 1, 2, of fig. 1. *a, a,* is the shaft or chimney which encloses the furnace. *b, b,* the fire-places, which are divided from each other by a centre wall, *c. d, d, d,* are the pots which contain the composition. They are arranged in any convenient manner on the floors or "sieges" of the furnace; and the whole is covered over by the dome *e, e,* which is furnished with a number of openings *f, f, f,* for the purpose of getting access to the pots and the fire, as in the ordinary glass furnace. These openings are closed by fire-tiles; and when not required to be opened, are kept luted with fire-clay. A number of vent-holes *g, g, g,* are also made in the dome, for the purpose of allowing the exit of the products of combustion from the fire; and being furnished with tiles, with which they may be opened and closed at pleasure, the draft and heat of the furnace may be regulated with ease, as in ordinary glass furnaces. If the pots containing the composition are put into the furnace before the fire is clear, that is, while unconsumed carbon is floating about, it is absolutely necessary that the pots should be covered over, in order to exclude any carbonaceous matters, which would otherwise injuriously affect the composition as to color and quality, and would convert the mass into a body that would not be workable with a chisel, and consequently render it useless, or nearly so, for the purposes required.

It is advisable to heat the pots thoroughly before putting in the ingredients of which the composition is composed, and also to allow the heat to act upon the composition in the pots as freely as possible, according to the judgment of the manufacturer; but every precaution must be taken, when making statuary or other marbles, to exclude carbonaceous matters from the composition, for the reasons before stated. When the composition in the pots is completely agglutinated or melted, so that it will run (which can be easily ascertained

by trial rods), the composition must be poured out of the pots down the holes *h*, in the bottom of the siege, from whence it will run into a trough *i*, situated in a tunnel or chamber *j*, below. This tunnel or chamber is built of bricks, and is made just large enough to receive the trough, and leave a clear space of a few inches all round it. The trough is also composed principally of fire-bricks, which are built up upon an iron frame or plate *m*, mounted on rollers. The bricks are to be neatly and firmly cemented together with very finely ground fire-clay. Previous to commencing operations, the trough, or rather the bottom-plate *m*, is run into the tunnel, and the hole *h*, closed up by means of a fire-tile, and the bricks forming the sides are built up on the foundation-plate of the trough. As the sides and ends are formed, the spaces between the sides of the trough and the sides of the tunnel or chamber are filled with sand, which should be rammed down well; and when the trough is completed, the outer end *k*, of the tunnel or chamber must be built up so as to completely enclose the trough. When the fire is lighted, and has become cleared of floating unconsumed carbon, the heat is made to pass down through the hole *h*, into the tunnel, by removing the fire-tile which covers the hole, and from the tunnel it passes through a side flue *l*, *l*, back into the large chimney or shaft *a*, *a*. By this means the trough in the tunnel is soon made very hot, and when the whole of the composition from the pots is completely melted, it is run into the trough, where it will form one uniform mass of great density; and the tunnel or chamber being previously heated to a very high temperature, the mass will not be too suddenly cooled by its removal from the pots.

Immediately that all the composition is poured into the trough, the hole *h*, through which the composition is run off, is again stopped with a fire-tile, and consequently the draft and heat of the furnace is prevented from entering the trough or tunnel, but is conducted into the main shaft or chimney, through one of the vent-holes *g*, *g*, which is now opened. The composition then cools very gradually in the trough, and when quite cold, the end *k*, of the tunnel or chamber is

removed, and after removing the sand, the trough is drawn out of the tunnel on the rollers; then, upon removing the bricks that have been built up on the frame, a solid block of artificial marble will be obtained.

Small portions of the bricks or fire-clay of which the trough was constructed may perhaps be occasionally found to adhere to the composition, but these extraneous matters must be removed by the application of an ordinary marble saw, used with caution. Upon charging the pots or vessels after they have been heated through in the furnace, the pulverized ingredients should be put in in as light a manner as possible, and as, by fusion, they gradually sink down and become a uniform mass, additional quantities of these pulverized ingredients should be added from time to time until the vessels are nearly full. The whole mass should be then kept exposed to an intense heat, as before mentioned, for several hours, and occasionally stirred with a proper instrument, if found desirable, for the purposes of producing uniformity of substance; after which it should be poured out to cool gradually in the troughs, as has been already mentioned, and, by being allowed to cool very gradually in these heated troughs, it becomes annealed, and a compact solid substance, closely resembling marble, is the result. When the pots are full of the composition they are very heavy to move about; the attendants therefore are furnished with long iron instruments, called "tilting irons," with which they are enabled to lift the pots and pour out the composition with comparative facility.

Instead of casting the composition into a solid block it is proposed sometimes to make it into slabs, and to effect this object the composition (when perfectly agglutinated) is poured on to flat tables, and rolled out into slabs of any required thickness, in a similar manner to the operation of plate-glass making. When brought to the proper or required thickness, the slabs should be removed to an annealing furnace of the ordinary construction, where they may be annealed in the same manner as plate-glass is now done.

The pots or vessels containing the pulverized ingredients are made of the best fire-clay, and care must be taken that

all carbonaceous matters are excluded from the materials of which these pots or vessels are composed, as such carbonaceous matters would otherwise act prejudicially on the composition, and deteriorate it both as to color and quality, as in the former case.

In order to facilitate the heating of the pots or vessels in the furnace, and also to prevent them from adhering to the sieges or bottom of the furnace, they are mounted on fire-bricks, so placed as to allow the heat to play or act on the under sides of the pots, as shewn in the figures; this, however, is not very material.

When it is required to impart any ornamental color to the composition, as may be necessary for chimney-pieces, slabs, tables, and other similar articles, the patentee employs such metallic oxides as are not volatile, and are used for similar purposes by porcelain manufacturers. In adding these coloring matters, a small quantity of borax, in a dry and pulverized state, is mixed therewith, for the purpose of acting as an additional flux upon the metallic oxide. The quantity of coloring matter may be varied according to the fancy of the manufacturer, and it is, with the borax, added while the pulverized ingredients of which the mass is composed are in the furnace, and before a general fusion of the particles begins.

The patentee states, that, although he has given the proportions in which he proposes to mix the several ingredients for the purpose of producing artificial stone, yet he does not intend to confine himself thereto, as they will necessarily vary according to circumstances and the natural state of the several ingredients, as before mentioned; nor does he intend to claim the furnace above described; but he does claim the production of a composition from sulphate of barytes mixed with other materials or ingredients (as before described), such as glass, borax, and other fluxes, for the purpose of more easily fusing or agglutinating the same into a solid mass.—[*Inrolled in the Petty Bag Office, September,* 1845.]

Specification drawn by Messrs. Newton and Son.

To James Ivers, *of Preston, in the county of Lancaster, machine-maker, for his invention of certain improvements in machinery or apparatus for preparing, roving, and slubbing cotton, wool, and other fibrous substances.*—[Sealed 22nd April, 1845.]

These improvements consist, firstly, in the novel and peculiar manner of applying the pressure to those flyers which are commonly termed presser-flyers; a double elastic spring being adapted, which has its fulcrum on a central stud attached to the tubular arm of such flyer. Secondly, in the application of either steel or case-hardened iron presser-levers or spurs to the flyers, which will be found to be a considerable improvement both in lightness and durability, in comparison with the ordinary brass "pressers" now in use. And, thirdly, in forming (if it should be preferred,) a hard or pressed bobbin of rovings perfectly cylindrical from one head or shroud of the bobbin to the other, instead of forming the bobbin of rovings with conical ends, as usual: this effect can only be produced by the use of the improved presser made of steel or case-hardened iron, which presser is rendered so light as to be capable of winding on a hard or pressed bobbin completely up to the shrouds or ends.

In Plate XIV., fig. 1, is a front elevation, and fig. 2, a side elevation of the improved flyer complete, with spindle and bobbin attached. *a*, is the spindle; *b*, *b*, the flyer, one arm being solid and the other tubular for the passage of the roving; and *c*, is the presser-lever, formed as usual, for conducting the roving and winding it on to the bobbin *d*, compactly; but, in this instance, it is made of steel or iron case-hardened, instead of brass, as in common use. Now it will be seen that the principal feature of novelty consists in the employment of the double elastic spring *e*, *e*, by which the presser is kept against the bobbin of rovings as it is formed; the upper end of this spring having a fixed bearing at *f*, and the lower end of the same acting against the tail of the presser at *g*, as usual, and having, as it were, a double

elastic action, by means of its central fulcrum swivelling on the stud *h*, which is fast to the arm of the flyer.

The patentee claims the novel and particular construction of presser-flyers, to be employed in the preparation of cotton for spinning, as herein described and set forth; and particularly the application and use of the double elastic spring *e, e*; and also the application and use of steel or case-hardened iron pressers, instead of brass or composition metal, as usually employed; and also the making or forming of cylindrical-pressed bobbins of rovings without taper ends, by the use of the above-described presser-flyer.——[*Inrolled in the Petty Bag Office, October,* 1845.]

Specification drawn by Messrs. Newton & Son.

To William Shepherd, *of Manchester, in the county of Lancaster, calico printer, for his invention of certain improvements in the art of printing calicoes and other surfaces.*—[Sealed 19th April, 1845.]

These improvements in printing calicoes and other surfaces, apply chiefly to printing piece-goods or fabrics manufactured from cotton, wool, or other fibrous substances, or mixtures thereof; and consist, in the first place, in the application to such purposes of a peculiar preparation of caoutchouc or India-rubber, now commonly termed vulcanized India-rubber, either employed as a covering for rollers or bowls, or used as an endless printing-blanket or web, in lieu of the ordinary woollen or other blanket at present employed.

It is stated that the elasticity or compressibility of the vulcanized India-rubber surface or blanket is much more uniform; the tendency to harden or soften with variations of temperature being almost entirely obviated. The improvement in printing, herein described, as resulting from the use of the said vulcanized India-rubber, will be principally experienced in the printing of woollen, cotton, and similar fabrics; but it will also be experienced in a great degree in the letter-press, lithographic, copper-plate, and other printing processes, where woollen or other blanket, or elastic bed, is commonly used.

The second part of the invention consists in the application of an apparatus to the ordinary printing-machine for cleaning the said vulcanised India-rubber web, or blanket, or bowl, by which the use of grey or unfinished pieces of calico, &c., commonly employed for keeping the ordinary printing blanket clean, is dispensed with, and a great saving of steam in drying, and power in turning, is effected, a finer impression is obtained, and the machine made more compact, in consequence of the ordinary drying and blanket rollers being removed. When this improved web or blanket is employed for calico or similar printing by the common machines, the web or blanket to be formed of vulcanized India-rubber should be about seven-eighths of a yard or nine-eighths wide (or of any other convenient width, as required), and from four to six yards long, evenly joined at the ends; and as the joining the ends of the web has to be effected before the process of vulcanizing, one side of the machine will be required to be moved to admit the blanket on to the printing-bowl; it is then to be passed over a frame, of which a sketch is exhibited in Plate XIV., and which may be applied above the printing-machine, in place of the ordinary blanket-rollers. A, is the first drawing-roller, made of copper, turned quite true; the web or blanket B, in passing over this, comes in contact with a doctor C, formed of a stiff bar of brass, with a flat edge towards the blanket, and a sloping edge on the other side, and having a small trough to receive the color scraped from the blanket; it then passes downwards in front of a friction-roller D, over which a short endless blanket or web E, (also of vulcanized India-rubber or other suitable material) works, and in an opposite direction to the printing-blanket B; the roller D, being fluted, and the web E, drawn tight over it, and set against the printing-blanket by means of the screw E. The roller then acts as a circular doctor, scraping and drying any color that may have passed the first doctor, which color is conveyed along the web E, over the roller G, when it comes in contact with another doctor F, by which the color is ultimately removed; the printing-blanket then passes over a steam-drying cylinder H, to remove any damp that may remain over the tension-roller I, and is returned to the printing-bowl J.

The third part of the invention consists in the novel and peculiar construction of what is termed in printing a sieve-roller; the important feature of novelty in which, is the elasticity imparted to such roller by the medium of air, confined between the outer covering and inner body of such sieve-roller. These rollers are employed for transferring color to surface-rollers or copper-printing rollers, in printing woollens or cottons by machines. The improved sieve-roller is formed of an iron centre, about one and a half inches in diameter, and about thirty-two inches long (according to the machine it may be required for), with two flanges about five inches in diameter grooved on the edge to the depth of half an inch,—the flanges to be fitted on to the width required for the goods intended to be printed. Twenty-eight inches will be found amply wide enough for seven-eighths cloth; but care must be taken that the flanges are fitted on accurately so as to be air-tight, and a tap for admitting air must be screwed into one of the flanges. The grooves are fitted with strips of sheet India-rubber, moistened with turpentine, and wound on until level with the edge of the flanges; and the space between the flanges is filled with soft flannel evenly wound on to the level of the flanges. A sheet of India-rubber is then joined into the form of a pipe or cylinder to fit the flanges, and it is drawn over so as to form a covering for the roller (it having been previously dusted in the inside with powdered French chalk, to cause it to slip easily); the ends are joined to the rubber in the grooves by moistening with turpentine. The roller must be covered with a sheet of gauze or cotton cloth coated with caoutchouc, which is intended to prevent the India-rubber from distending when inflated, and for fixing on the rings for keeping the colors separate, when used for printing more than one color; the rings are cut from a sheet of rubber about a quarter of an inch thick, and to the length required to go round the roller; one edge to be the thickness of one-eighth of an inch, and the other tapering; they may be made to adhere by wetting the edge with turpentine and applying it to the gauze: the woollen sieve or strips are then sewed on for printing. The elasticity of this sieve-roller may be varied by regulating the

quantity of air confined under the outer surface of the roller.

The fourth part of this invention consists in the application of a covering of spongy or porous vulcanized rubber, placed on a centre or axis of iron or wood, to be used as a roller for furnishing surface or copper-printing rollers with color; and also the applying of India-rubber rings or divisions, made by strips of rubber being attached to the surface of ordinary woollen or other sieves, for surface-printing, by which means various colors may be printed at the same time, both in "pegging" and "rainbowing." In forming the rollers from the spongy vulcanized rubber, a cylinder or tube made of the material, at least one inch thick, and of the size required, is drawn over a wooden or iron centre, to fit the diameter of the roller, the same as the elastic or air-roller before described.—[*Inrolled in the Petty Bag Office, October*, 1845.]

Specification drawn by Messrs. Newton and Son.

To John Hick, *of Bolton-le-Moors, engineer, for certain improvements in machinery or apparatus for cleaning wheat and other grain or seeds from smut or other injurious matters,—being a communication.*—[Sealed 7th April, 1845.]

These improvements consist in a peculiar construction or arrangement of apparatus adapted for cleaning wheat and other grain or seeds. In Plate XIV., fig. 1, represents the machine drawn in elevation, and fig. 2, is a vertical section of the same. It consists of an outside casing of conical form, with the exception of a conductor or hopper *a*, for introducing the grain and a spout or covering to an outlet passage at *b*. This circular casing is composed of triangular files *c*, *c*, *c*, made of iron case-hardened, the necessity of using which will be hereinafter explained. They are placed at such distances apart as to allow the disengaged smut or dirt to pass out freely between them, and at the same time retain the grain within. The lower ends of the files are placed in a groove provided for the purpose in the rim which supports them, shewn at *d*, fig. 2, and they are

fixed in their places by filling the angular spaces between them, within the groove, with pieces of lead or other metal: they are also fixed in the upper rim *e, e,* in like manner. When thus placed, they are secured by screw-bolts passing through the lower rim into the bottom of the pillars *f, f,* shewn in the drawing, and also through the lateral projections of the upper rim into the top of the same; thereby firmly connecting the two rims with the fan thus extended between them. This triangular form of files is preferred as being best adapted to the discharge of dust as it becomes separated from the grain by the process of cleansing, on account of the outwardly diverging sides. Within the case of files *c,* is a conical chamber *g, g,* (see fig. 2,) composed of quadrangular files made of iron case-hardened. These files *g,* are in like manner fixed in the rings *h, h,* and *i, i;* and *k, k,* are rods for securing them together. The inner structure of files is connected to the vertical shaft *l,* at the centre, as shewn in the drawings, and becomes the revolving part of the machine; its dimensions are such as to allow a space for the passage of the grain between its outer surface and the inner surface of the files *c.* As all files are liable in the process of manufacture to wind and twist, more or less, and as it is essential in this machine that the acting surfaces of the files, to insure an uniform action upon the grain, should be uniformly even,—the advantage of using files made of iron case-hardened about the sixteenth of an inch below the surface, rather than steel files, is obvious, from the great facility of producing a uniform surface. The case-hardened file still possessing flexibility, all imperfections as to wire and twist can readily be obviated, and the cost of the machine greatly reduced. With respect to the amount of space between the acting surfaces of the files, the apparatus is regulated and adjusted by means of the bar *m,* attached to the bottom of the lower rim by screw bolts, through the lateral flanges with which it is supplied at each end, so as to secure it as a bridge-tree to the shaft *l.* *n,* is a socket having a box at its centre, to which a piece of steel or other material is fitted, so as to form the step for the foot of the shaft *l.* *o,* is an adjusting screw, extending upwards till it comes in contact

with this step, by means of which the shaft and its appendages are raised and let down at discretion, without changing its vertical position. From the conical arrangement of the outside series of files *c*, and the inside files *g*, connected with the shaft (the inclination of which cones are equal to about an inch in twelve of their length), it is obvious that, by raising or letting down the step, by the action of the screw, the space between the two sets of files is increased or diminished. An inward inclination is given to the upper section of the outside plate of the hopper or conductor *b*, for introducing the grain, as already referred to, in order thereby to present it to the action of the files as near the top as practicable. From thence the same plate is extended in the direction of the files, with its inner surface flush with theirs, to the lower groove, in which it terminates. To each of the arms which connect the inside lower rims with the shaft, a plate *p*, of sheet-iron is attached. These plates serve as vanes or wings for the purpose of ventilation, and, in order to provide space and passage for the air brought in action thereby, as well as to confine it so far as to give effect to the wings and other co-operating parts of the machine in motion, the inside edge of the lower outside rim is extended down by means of a flange; and a thin horizontal plate, with a circular opening at the centre, is attached to the bottom of the flange, by screws or otherwise. The entrance from the space for the circulation of the grain between the files into the spout, as the outlet passage, is shewn at *q, q*, being an opening provided between the inner edge of that side of the spout which the grain, carried round by the machine, first approaches, and the nearest edge of the plate of the feeding-tube above described. Or, instead of this mode of discharging the grain, an opening is provided for it to pass out as soon as it reaches the bottom of the passage in which it circulates between the files, and they cease to operate upon it. For this purpose, the lower revolving rim is elevated so as to place its upper surface about half an inch above that of the outside rim next to it, and, by giving an inward bend to the edge of each, a space is left between them, throughout their entire circle, about equal to that between the files. Either of these modes

of discharging the grain may be used at pleasure, and the choice depends somewhat upon the size of the machine employed. One may be large enough to scour the grain sufficiently at once going round, while another of smaller dimensions may require longer circulation. Another modification, which may be adopted or not at discretion, is the employment of smooth triangular bars, instead of files as above described; in which case, the inner edge of each bar, which the grain, as it circulates, first approaches, is made to project inward beyond the nearest edge of the next, which precedes it about one-sixteenth of an inch, more or less, at discretion, in order to contribute to the cleansing operation of the machine, without cutting or injuring the grain. This position of the bars is effected by giving a corresponding form to angular pieces of metal, as above pointed out for keeping the files in place in the groove. Or, as a further substitute for files or bars without teeth, or both, when the nature of the grain, or of the impurities from which it is to be freed, or other considerations, may render it expedient, cast-iron plates may be used, ground in the manner represented in fig. 3, with their ribs and furrows more or less inclined, at discretion; the plates being made conformable to the circle and conical inclination required.

The patentee claims the application and employment of the case-hardened iron files or bars in the formation of the conical, convex, and concave surfaces of the aforesaid machine; and also the whole machine, in combination or arrangement, in the manner and for the purposes above described and set forth.—[*Inrolled in the Petty Bag Office, October*, 1845.]

To Samuel Faulkner, *of Manchester, in the county of Lancaster, cotton spinner, for certain improvements in machinery or apparatus for carding cotton and other fibrous substances.*—[Sealed 25th July, 1843.]

These improvements in machinery or apparatus for carding cotton and other fibrous substances, apply more particularly to that construction of carding-engine or machine which is

fully described and shewn in the specification of a former patent granted to the present patentee 6th August, 1835.

The invention consists, firstly,—in a peculiar arrangement and combination of mechanism for effecting the process of carding in a much more perfect and economical manner than has hitherto been accomplished, and differing from carding-engines now in use, and also from that of the patent just referred to. Secondly,—in the novel application of a preliminary breaker-roller or cylinder, working below the doffer cylinder, in combination with a certain arrangement of smaller revolving carding-rollers; and also certain blades or straight-edges connected therewith, for the purpose of opening or breaking up the cotton, &c., prior to its being submitted to the carding operation usually performed by the main carding-cylinder and other smaller carding-rollers; which arrangement of mechanism will enable the carding-engine to perform a much greater quantity of work, and to produce the sliver at one operation as perfect as it is frequently performed by submitting the cotton to the operation of a second carding-engine. Thirdly,—in the application, use, or employment, of wrought-iron or common gas tubing, for the construction of the smaller carding-rollers, and having a solid pivot in each end for a bearing, for the purpose of combining great strength and lightness in these rollers.—And also in the application of a leather covering for the larger carding-cylinders, when made of metallic rings, covered with sheet-iron; which leather covering is employed instead of the cement commonly used for this purpose. Fourthly,—in the novel application of a series of top carding-rollers and certain straight-edges or blades, placed above the main carding-cylinder, in combination with the series of bottom carding-rollers and straight-edges or blades, as employed in the patentee's former improved carding-engine. Fifthly,—in a particular manner of employing the revolving brush or roller-clearer, which is moved round in the arc of the main cylinder and breaker-cylinder, and continually passed in contact and over the several top carding-rollers, to clean or strip them of motes or other extraneous matter

collected by them during the carding process: that is, the improvement consists in causing the revolving stripper or clearing-brush to advance gradually and progressively from one carding-roller to the next, at certain intervals, throughout the entire series of rollers, and to make a number of revolutions in contact with each roller separately (whilst the carding-roller makes rather more than one revolution), and then pass on to the next; thereby effectually and completely cleaning or stripping every card-roller separately, and in succession, and clearing them from all motes, or whatever they may have collected; instead of merely licking or clearing that point of each roller which may happen to be in contact with the brush as it passes over the whole range, as hitherto done. Sixthly,—in the application and employment of a peculiar construction of comb for cleaning or stripping the above-named clearing-brush, by the use of which the waste or extraneous carding is taken on the points of the teeth of the comb from the clearing-rollers. Seventhly,—in a certain improved construction of the plates, steps, or bearings, for facilitating the action of the feed-rollers, and allowing them to adjust themselves by the action of a spiral or other spring, instead of a weighted lever, as in general use, and thus be relieved from any strain, in the event of knots or other imperfections passing with the cotton between them; and also in certain other improved plates, steps, or bearings, for fixing, setting, or adjusting the position of the smaller carding-roller with the main or larger carding cylinders, so that their peripheries may be suitably adjusted or set for performing the carding operation in the most perfect manner. And, eighthly, —in performing the operation of "doffing" (that is, stripping or removing the sliver or filamentous sheet of carded cotton, &c., from off the surface of the doffing-cylinder) by the novel application of a current of air, supplied by a suitable apparatus, instead of doffing by means of a bar or comb, as hitherto practised.

In Plate XV., fig. 1, represents an elevation of the improved carding-engine; and fig. 2, a longitudinal section taken through the middle of the same. It is particularly arranged and adapted in these views for carding Sea-islands' cotton,

for spinning the finer numbers of yarns; and may be made of any width it is common to construct carding-engines.

This improved engine, it will be observed, is fed in the ordinary manner, from a feeding-cloth A, driven by any convenient connecting motion of the engine; and the feeding-cloth is placed below the doffing-cylinder B, in front of the card. From the feeding-cloth A, the cotton is uniformly delivered to the feeding-rollers C; and the gearing for effecting this, and all the other motions common to carding-engines, is shewn at fig. 1; but being well understood by every competent mechanic, and subject to variation, as circumstances may require, it is not necessary to enter into more particular detail. The cotton is then passed under the operation of a breaker-roller D, covered with cards, and a series of carding-rollers E, E, with their accompanying straight-edges or blades F, F^1, arranged below or around the lower portion of the roller D. The first series of blades F, act on each carding-roller E, as a stripper; and the second series of blades F^1, are placed at such a distance behind the first as is considered sufficient to allow the dirt, motes, or other extraneous matter, to escape as it is disengaged by the action of the cards; this straight-edge is also intended to knock off any dirt that may be upon the face of the breaker or carding-cylinder D, but for that purpose it is not considered new. From experience, it has been ascertained that from one-eighth to one-fourth of an inch is sufficient space or opening to allow between the two blades F, F^1.

The cotton now having passed this first breaking or carding process, and beyond the action of the series of rollers and blades, a very considerable portion of all the extraneous matter is separated from it, and will have fallen upon the floor below the cylinder D. The cotton is now taken off the cylinder D, by means of the intermediate card-cylinder G, which conveys it to the main carding-cylinder H, where it is submitted to the action of that cylinder and the lower series of carding-rollers I, I, and their assistant clearers, blades, or straight-edges J, J, on the lower part of the periphery of the main cylinder, and thereby receives an increased carding, to disengage that portion of motes and other extraneous matter

which may still remain from this part of the process. The cotton continues to pass with the main cylinder until it is submitted to the action of the top series of carding-rollers K, K, and their clearers, blades, or straight-edges L, L, which are more particularly intended to take out the small white "neps" or knots which still remain, and are mostly found in fine or Sea-islands' cotton; and it is chiefly for this purpose that they are considered useful: in carding coarser cotton they may be dispensed with.

The cotton being now completely carded, is taken off the main cylinder H, by the doffing-cylinder B, and is removed therefrom either by the ordinary doffing-comb or bar M, (see fig. 1,) or by the improved mode of doffing hereafter described, and conducted in a sliver, as usual, into cans or receptacles through a pair of delivering rollers, revolving in the box N.

The foregoing description being applicable to the general arrangement of the carding-engine, and to the first and second features of the present improvements; and the third being for the construction of the carding-cylinders, as previously described,—the patentee proceeds to describe the fourth feature of novelty: that is, the peculiar office and working of the revolving clearers or brushes O^1, O^2, for cleaning or stripping the small carding-rollers E, I, and K, around the breaker and main cylinders. These revolving clearers or brushes O^1, O^2, have been heretofore employed, but not in a similar manner, as here applied; they are mounted at the extremities of two arms P, P, affixed to the toothed segments or wheels Q, Q, one on each side of the engine, and are caused to pass from one carding-roller to another (after the brush has made several revolutions, in contact with each roller, as it slowly revolves), and there to continue for a short interval, or until it has completely cleared each roller, and then to pass on to the next in succession, and proceed to clear that also; which performed, the brush is passed onwards to the next, and thus completes the entire series; the one brush or clearer O^1, effectually cleaning each of the small carding-rollers E, around the breaker-cylinder, and the

other brush or clearer o^2, cleaning the series of carding-rollers I, and K, around the main cylinder.

The mechanism employed for the purpose of shifting the brushes or clearers o^1, o^2, and stopping them for a certain interval, whilst they strip the card-rollers, may of course be varied, according to the discretion of the operator. The patentee employs an ordinary arrangement of gearing and catch-boxes for reversing the passage of the brush after it has completed its circuit, and conducting it back again, in a similar manner, to the position from whence it first commenced. In the arrangement of the engine, as shewn at fig. 1, this alternate action of the clearers o^1, and o^2, is effected by the several pins or studs 1, 2, 3, 4, &c., fixed upon the side of the brush-wheels Q, coming alternately in contact with a projection or neb S, in connection with a catch-box motion, thrown in and out of gear by any suitable means, for the purpose of stopping the clearer O, over every carding-roller, and passing it on to the next, as required. At fig. 9, an arrangement of gearing for this purpose is shewn; but it may be varied if required, provided the constant clearing action of the brush is maintained opposite each carding-roller separately, and having made several revolutions in contact with the carding-roller, is passed onwards to the next, and so on, throughout the entire series; of course, it will be seen, that one pin is required for each carding-roller, except the first of the range; and that the first pin 1, is required to stop the clearer O, at roller No. 2, in each cylinder, and so on to each roller, as the brush moves to strip them.

In the improved arrangement of carding-engine, the segment-toothed wheels, for working the clearers or brushes O, are placed one on each side of the carding-cylinders, and connected together by a shaft and pinions, crossing the card below the doffing-cylinder: by this means, the brush is always moved through the arc of the cylinder, square and true, and is thereby enabled to strip the rollers effectively. The brush o^1, which works in connection with the breaker-cylinder D, strips each card-roller three several times, whilst the brush o^2, which works round the main cylinder H, strips

each of its rollers once: this arrangement is desirable, as the rollers on the breaker-cylinder are working the cotton in its dirtiest state, and consequently require more cleaning themselves.

The sixth feature of the improvements in carding-engines, is shewn in the sectional view fig. 3, and in the back view fig. 4, which shews the peculiar form of the comb used for cleaning or stripping the revolving brushes or clearers o^1, and o^2. The shape of the teeth of the comb is shewn at *a, a*, and the edge of the teeth nearest the brush is formed of the same curve as the periphery of the brush; the teeth *a, a*, are of sheet steel, and placed or fixed in a rod or tube *b*, for support at the spaces apart, as seen at fig. 4. The short fibres of the waste or extraneous carding, which it is desirable to remove, are taken upon the points of the teeth of the comb in almost separate fibres, and pressed between the teeth *a, a*, of this comb: each fibre forces the other through, until a small strip of waste is formed at the back of the comb, and falls off by its own weight, without any assistance from the attendant.

The seventh part of the improvements is shewn in the front view fig. 5, and sectional view fig. 6, and consists in a simple mode of fixing, setting, or adjusting the small carding-rollers E, I, and K, and their clearers, blades, or straight-edges F, J, or L; namely, by the plates or steps *c, c*, and the adjusting or set-screws *d, d*, which is an improvement upon the plan shewn in the inventor's former patent. The arrangement for allowing self-adjustment to the feeding-rollers C, is shewn in section at fig. 7, and consists in the application and use of the spiral-spring *e, e*, working in its box, and pressing on the bearing or step of the shaft of the upper feed-roller, instead of using the common weighted lever for this purpose.

The patentee also claims the separate attaching or fixing-plate *f, f*, of the feed-rollers, and its adjusting-screws *g, g*. Lastly,—the improvements in the mode of doffing the sliver of cotton, or removing it from the doffer-cylinder B, is exhibited in its relative position, attached to the doffer-cylinder at R, fig. 2, and, on an enlarged scale, in the cross sectional view of the apparatus, fig. 8. It consists of a hollow tube *g*, having

vanes or fans *h*, around its periphery; this tube is to be driven at a great velocity, in order to collect the air at its open ends, and disperse it through the holes *i*, around the periphery of the tube, into the space formed by the outer tube or casing *k*, in which the hollow fan revolves; and the current of air being discharged through the opening or slot along the tube, and against the whole breadth of the doffing-cylinder, will strip off or doff the sliver of cotton, without the aid or assistance of the ordinary doffer-comb. The extreme edges of the vanes or leaves *h*, may either be caused to act upon the outer fibres of the cotton, to assist the operation, or not, as found necessary.—[*Inrolled in the Petty Bag Office, January,* 1844.]

Specification drawn by Messrs. Newton and Son.

To THOMAS RUSSELL, *of Kirkcaldy, in the county of Fife, iron-founder, and* JOHN PETER, JUN., *of the Kirkland Works, in the same county, Esq., for certain improvements in flax spinning and flax-spinning machinery; which are also applicable to the manufacture of other fibrous substances.*—[Sealed 6th January, 1845.]

THIS invention consists in passing the sliver of flax or other fibrous substance required to be spun, through water, or through some coloring fluid, while it is yet in an untwisted state.

The drawing in Plate XIII., is a vertical section of part of a flax-spinning frame, suitably arranged for carrying out this invention. *a*, is one of the retaining-rollers; *b*, one of the drawing-rollers; and *c*, a trough, containing water or some coloring fluid. *d*, is the sliver of untwisted flax or other fibrous substance, which, after leaving the drawing-rollers *b*, is carried under a small roller *d*, partly immersed in the water or coloring fluid, and then passes between the compressing-rollers *e*, *e*, which keep the sliver still untwisted, and serve also to free it from any superfluous moisture. The flax is thence conducted to the other parts of the machine, to be spun in the ordinary way. By subjecting the sliver to this preliminary wetting, the subsequent process of spinning is facilitated, and the thread improved in quality; and when

the fluid through which it is passed is of such a description as to dye as well as wet the sliver, the thread is produced at once in a colored state, instead of having to be dyed afterwards by a separate process, as usual.

The patentee claims, Firstly,—the wetting of flax and other fibrous substances while they are yet in an untwisted state, or in the state of sliver, and in the course of passing through the spinning-frame, or other machine or machinery, in order to be twisted or spun. Secondly,—the dyeing as well as wetting of flax and other fibrous substances while they are yet in an untwisted state, and in the course of their progress, as aforesaid, to be twisted or spun. Thirdly,—the additions to, and modifications in, the ordinary flax-spinning frame before described, and the application thereof to other spinning machines or machinery.—[*Inrolled in the Inrolment Office, July,* 1845.]

To JOHN M'INTOSH, *of Glasgow, Gent., for improvements in preparing materials for coloring and printing calicoes and other fabrics; and improvements in printing and ornamenting fabrics.*—[Sealed 8th May, 1845.]

THE first part of this invention consists in combining flock, of any required color, with a clear solution of India-rubber or of gutta-percha, and employing the mixture for printing on calico, paper, or other fabrics, in place of the usual coloring materials.* This mixture is printed on to the fabrics in the same manner as when the ordinary colors are used; and the flock is caused to adhere firmly thereto by the India-rubber or gutta-percha. The solution of India-rubber or gutta-percha is preferred to be made with naphtha.

The second part of this invention consists in applying a roller, coated with India-rubber, to engraved rollers or plates, for the purpose of keeping the engraving clean. In printing from engravings on rollers or plates, it has hitherto been the

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* The application of India-rubber as a cement for causing the flock to adhere to various fabrics, was patented by Mr. Kingdon, in April, 1842.—See Vol. XXI., p. 451, Lon. Jour.

practice to wash out the engraving frequently, in order to remove the color that has dried thereon; instead of which, the patentee causes a roller, coated with India-rubber, to press against the engraved roller, as it revolves, and thereby remove the coloring matter that would otherwise adhere thereto: when applied to an engraved plate, the roller is caused to pass to and fro over the plate.

The last part of this invention consists in apparatus for spreading the color on a suitable sieve-cloth or felt, from which it is to be taken up by the blocks used in block-printing. In Plate XV., fig. 1, is a longitudinal section, and fig. 2, a transverse section of the apparatus. *a*, is a bag containing water suitably thickened, as usual in making sieves for block-printing; *b*, the framing that supports the sieve; and *c*, a felt, spread evenly over the sieve, and fastened at its edges to the frame. *d*, is a trough, containing the color, and *e, e*, are brushes; and it is the use of a trough to contain the color, moving over the surface of the felt or sieve-cloth with the brushes (instead of simply using a brush to spread the color), which constitutes the novelty of this part of the invention. The lower part of the trough is open, and presses upon the sieve-cloth; henee, as the trough is moved, a quantity of color is deposited upon the sieve-cloth, and spread evenly by the brushes. The patentee does not confine himself to the peculiar shape of the trough shewn in the drawing, or to the arrangement of the brushes, although he prefers the same.

The patentee claims, as his invention, Firstly,—the using flock combined with a solution of India-rubber or of gutta-percha as a printing material. Secondly,—the mode of cleansing engraved printing-rollers or plates with a roller or surface of India-rubber. Thirdly,—the application and spreading of color from a trough or vessel, open at bottom, on to a sieve-cloth, and further spreading it by brushes, as above described.—[*Inrolled in the Inrolment Office, November,* 1845.]

To William Peter Piggott, *of No.* 11, *Wardrobe-place, Doctors Commons, in the city of London, mathematical-instrument maker, for certain improvements in mathematical, nautical, optical, and astronomical instruments; and in the mode of manufacturing dials and other graduated plates.*—[Sealed 17th April, 1845.]

These improvements in the construction of mathematical, nautical, optical, and astronomical instruments, and in the mode of manufacturing dials and other graduated plates, consist in the application of the electrotype process, as described below.

Firstly, with regard to graduated plates, such as those used for barometers, thermometers, quadrants, compasses, sun-dials, clocks, and such like instruments, and for reducing and laying down mechanical drawings, and as the scale of chains for surveying purposes, the ordinary mode of producing the divisions thereon, by engraving or dividing, is liable to errors, which the patentee proposes to obviate by his improved process. The new method of producing the graduated plate is as follows:—A plate is first prepared of a suitable size, and the required graduations, and figures or designs, are engraved thereon; a matrix or mould of this plate is then made in a composition of wax, and from it any number of plates are obtained in copper or other suitable metal, by the electrotype process; or, in place of forming a mould in wax, or other suitable composition, the same may be made in copper, from the original engraved plate, by the electrotype process. The plates are afterwards finished in the ordinary manner by silvering, which may be done by the electrotype process also, or by the ordinary mode of silvering.

The patentee claims, under this part of his invention, the production of graduated plates for mathematical, nautical, optical, and astronomical instruments, by means of the electrotype process, instead of the ordinary process of engraving or dividing.

The second part of this invention consists in a new mode of manufacturing the compass-box or case containing the magnetic-needle. The patentee observes, that the objections

to the present mode of manufacturing compass-boxes arise from local attraction, caused, in most cases, by small particles of iron, which, in the present mode of casting or manufacturing such boxes, become amalgamated and unequally distributed, and produce a variation in the needle. To remove the particles of iron, it is necessary to drill a small hole or holes in that part of the case supposed to contain them, which holes are afterwards to be plugged up and finished off, so as to form a perfect box or case. The patentee produces the boxes or cases in the following manner:—A mould is made of wax or other composition, and copper or other suitable metal is deposited upon it by the electrotype process, until the required strength and thickness is obtained. This case is afterwards finished in the ordinary manner. Or, sometimes the copper is deposited in the form of a sheet or block, and afterwards worked to the form of the case.

The patentee does not confine himself to the precise details herein mentioned; but he claims the application of the electrotype process for the purpose of producing certain parts of mathematical, nautical, optical, and astronomical instruments, as above described.—[*Inrolled in the Rolls Chapel Office, October,* 1845.]

To Richard Archibald Brooman, *of Fleet-street, in the city of London, gent., for a thread made from a substance not hitherto applied to that purpose, and also the application of it to the manufacture of piece goods, ribbons, paper, and other articles,—being a communication.*—[Sealed 27th March, 1845.]

This invention consists in producing thread from a resinous substance called *gutta-percha,* imported from the East Indies, and applying it to the manufacture of piece goods, ribbons, paper, &c.

The gutta-percha is cleansed, kneaded, and reduced to a plastic state, by the means described in the specification of a patent obtained by the present patentee, March 11, 1845, and is converted into thread by the machine represented in the cut in the margin.

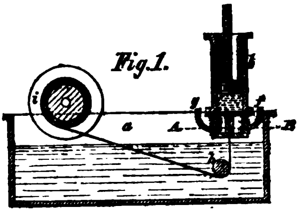


Fig. 1.

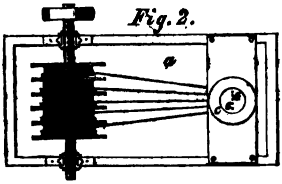


Fig. 2.

Fig. 3.

Fig. 1, is a vertical section of the machine; fig. 2, a plan view thereof; and fig. 3, a horizontal section on the line A, B, of fig. 1, looking from below. *a*, is a tank, containing cold water; *b*, a cylinder, firmly secured to the die-box *c*, by bolts, which serve to fasten both the cylinder and die-box to the top of the tank; *d*, a piston that works in the cylinder *b*; and *e*, a series of pipes, placed in a row across the die-box: the bore of these pipes is represented as being circular, but it may be square, triangular, or hexagonal, according to the shape required to be given to the thread. *f*, is a pipe for admitting steam of a high temperature (from 240° to 300° Fahr.) into the die-box, in order to heat the same; and *g*, is a pipe for carrying off the steam.

The following is the mode of manufacturing gutta-percha into threads by this machine:—The piston is first withdrawn from the cylinder, and the roll of prepared gutta-percha introduced; the piston is then replaced, and forced steadily down, by hand or other power, upon the gutta-percha, which, being softened at the lower end by the heat of the die-box, escapes through the pipes *e*, in a series of threads; these threads, as they become cooled by the water in the tank, pass beneath a roller *h*, and are thence conducted to and wound upon a set of revolving reels *i*, mounted in bearings at the other end of the tank. The threads are only slightly stretched in the act of reeling on the reels *i*; but they are afterwards transferred to a second set of reels, and, when being reeled thereon, are stretched out by hand, after the manner of hand spinning (that is, by working the thread between the fingers and thumb), to about four times their original length. The threads are then wound off on bobbins ready for use.

Instead of adopting the above process, the gutta-percha may be employed in the state of sheets (prepared in the man-

ner described in the specification above referred to; and either colored or uncolored, sulphurised or not sulphurised), and cut into strips and threads by means of revolving circular knives. But as, by this means, only flat or square threads can be produced, a round form may be afterwards given to them, if required, by attaching each thread at one end to a whirl, such as is used in rope-making, and at the other end to a hook, fixed in any convenient situation, and causing each thread to revolve at a rapid rate on its own axis, which will in a short time render it sufficiently round; or two or more threads may be twisted and spun into one round thread, by means of a bobbin and fly-frame.

The threads, thus produced, may be applied to the manufacture of piece goods, either by themselves or in combination with threads of silk, cotton, flax, wool, or other fibrous substances; and such combinations may be made either by covering or sheathing the gutta-percha thread with silk, cotton, flax, wool, or other fibrous substances (as in making caoutchouc elastic bands by braiding machines), and then weaving or manufacturing it into piece goods, or by interweaving it, in the naked state, with other threads.

A strong and perfectly waterproof fabric may be formed by laying a number of gutta-percha threads side by side upon a foundation of cotton, linen, or other textile fabric, and passing them between heated rollers, which has the effect of cementing the threads firmly to the fabric and to each other; and by using threads of different colors and sizes, every variety of striped pattern may be given to the fabric.

An article resembling diaper or mosaic work may be produced by laying gutta-percha threads of different colors in rows, one above the other, and cementing each row to the one beneath, by a solution of gutta-percha or other suitable cement; the mass is then cut tranversely into sheets of any required thickness.

The gutta-percha threads may be used in the manufacture of ribbons and other narrow goods, instead of the organzine silk now employed for the warp of such articles, especially galloons, doubles, and ferrets, used for bindings, bands, &c.

A paper, difficult to tear (and therefore suitable for docu-

ments exposed to much wear, such as bills of exchange, share certificates, &c., and for wrappers and envelopes), may be made by interposing, between two sheets of pulp, threads of gutta-percha, laid crosswise, like network, an inch or more apart.

The gutta-percha threads may be plaited, either in the naked or sheathed state, into hats, caps, and bonnets; or into bags, baskets, and basket-work; or into coverings for chairs, instead of cane; or into whips, bridles, and other articles.

These threads may be also twisted with threads of flax or other fibrous substance into cordage.

The patentee claims the manufacture of a thread from the resinous or resin-like substance called gutta-percha, and the application thereof to the manufacture of piece goods, ribbons, paper, and other articles.—[*Inrolled in the Inrolment Office, September*, 1845.]

To JAMES AMBLER, Sen., *of Manningham, near Bradford, York, manufacturer, for improvements in preparing and combing wool.*—[Sealed 1st May, 1845.]

THIS invention is only applicable to Botany, Saxony, or similar short fine wool. It consists in the following process of preparing and combing:—The wool is first washed; it is then carded in the usual manner, to open the staples and separate the fibres; after which it is again washed, and is filled on to the combs whilst in a moist or damp state: it is essential that the wool should be in a damp state, as otherwise, when combed, the top produced from the carding would not be good, or clear from "trash." The peculiar feature of novelty consists in combing short fine wool upon actuated combs, after being carded and washed.

At the conclusion of the specification, the patentee says, "What I claim is, First,—the carding of Botany, or Saxony, or similar short fine wool (and I may here state that my claim is only intended to apply to such wools, and I disclaim all others), and then combing it upon actuated rotatory combs, each having a movement towards their axis, when revolving,

and at the time of combing the wool; and I would have it understood that I only claim for combing such wools upon actuated combs, after being carded. Secondly,—I claim the backwashing of Botany, or Saxony, or similar short fine wool, after being carded, and before being combed; and I would have it understood that my claim only extends to such descriptions of wool."—[*Inrolled in the Inrolment Office, November*, 1845.]

To DOMINIC FRICK ALBERT, *of Manchester, Doctor of Laws, for certain improvements in the manufacture of candles.*—[Sealed 7th April, 1845.]

THESE improvements in the manufacture of candles consist, firstly,—in dipping an ordinary moulded candle (either made of pure tallow, or any other composition or combination of materials) into the mixture described below. And, secondly, —in the use or employment of the chief ingredient of such mixture as applied to the manufacture of candles.

The mixture is made in the following manner:—Take three parts by weight of gum damar (*pinus dammara*), which is a colorless resinous gum, two parts of wax or spermaceti, and one part of tallow, and melt them together. The temperature required to melt these ingredients (which are to be used as a coating or varnish) being higher than that to melt the body of the candle, whether made of pure tallow, stearine, or composite of any description, the candles will burn with a rim or cup similar to that of a wax candle, and to which they are equal in color, gloss, feeling, and hardness.

The patentee claims as his invention, Firstly,—the dipping of a moulded candle into the above-named mixture (or that which is so near it in qualities as to have a similar effect) for the purpose of coating or varnishing the candle, as aforesaid. Secondly,—the use of gum damar in the coating wax or varnish. And, Lastly,—the use of gum damar either in the body or coating of any kind or sort of candles whatever.—[*Inrolled in the Petty Bag Office, October*, 1845.]

Specification drawn by Messrs. Newton and Son.

To JOHN FELTON, *of Bolton Percy, near Tadcaster, station-master, for improvements in wafers, and in the means of securing letters and notes from being surreptitiously opened.*—[Sealed 15th April, 1845.]

THIS invention consists in the manufacture of four descriptions of wafers, to be used for preventing letters from being surreptitiously opened.

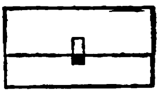
The first kind of wafer is made by mixing wheat-flour with five times its weight of the gum of the *phormium tenax* or New Zealand flax, and adding as much water as will reduce the mixture to a very thin paste; this paste is tinged with the required color, and poured into the tongs used for making common wafers, which have been first slightly heated, and greased with butter; the tongs are then subjected for a short time to the heat of a charcoal fire; and when removed, and allowed to cool, the composition presents the appearance of a dry cake, about the thickness of a playing card, ready to be punched into wafers.

The second description of wafer is composed of a thin solution of isinglass mixed with an equal quantity of the above-mentioned gum; the mixture is colored, and is then evaporated over a slow fire to such an extent that, when cold, it will be of the desired firmness. The apparatus used for forming the composition into a flat cake consists of a plate of mirror-glass, fixed in a metal frame, having a raised edge, corresponding in height with the required thickness of the composition; —the plate being warmed by means of steam, and greased, the composition is poured therein, and a second plate of glass, heated and greased, is placed over it, in such manner as to touch every part of the composition, and rest on the edge of the frame: when cold, the composition is punched into wafers.

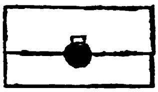
The third description of wafer is formed by coating paper, or very fine muslin, with the above mixture of isinglass and gum. The paper or muslin is stretched tightly on a frame, and two coats of the mixture are applied to each side; one coat being allowed to dry before the other is laid on, and the whole to be firm and hard before removing the material from the frame, in order to cut it into wafers.

The fourth kind are a species of fancy wafers, made by applying the mixture of isinglass and gum to the under or plain side of paper, either already embossed, stamped, or engraved, and cut into wafers, or about to be treated in this manner.

The first and second kinds of wafers are cut into the shape of lozenges, and used in the same manner as ordinary wafers. The wafers made according to the third improvement are cut into rectangular shapes: when applied to a letter, the wafer is moistened, and inserted to the extent of about three-fourths of its length under the fold of the letter, thus,



and impressed firmly with a seal or stamp; and then a seal of wax is placed over the lower part of the wafer, in this manner;



the upper part of the wafer, left shining through the paper, is termed the "cautionary index," as the patentee presumes that no one will attempt to open a letter so secured. The fourth description of wafers are cut into the form of lozenges, and used as ordinary fancy wafers.

These wafers cannot be dissolved by water, spirit, or any other known means; nor can a letter fairly secured by one of them be opened without furnishing the means of certain detection.

The gum, above mentioned, is obtained by forcibly pulling the centre leaves of the *phormium tenax* or New Zealand flax from the socket that connects them with the root; this socket immediately secretes a quantity of the gum, which can be collected with a spoon.

The patentee disclaims the methods, above described, of making the first, second, and fourth kinds of wafers. He claims the making of wafers of paper, cloth, or any other material, anointed with any substance or composition on both sides; likewise the rectangular form of wafers, and the method of leaving the upper part of the wafer uncovered with sealing-wax, as a "cautionary index;" also the application of the gum of the *phormium tenax* or New Zealand flax in the manufacture of wafers or instruments for preventing letters

and notes from being surreptitiously opened; and, lastly,—the compositions, mentioned above, of which the wafers are formed.—[*Inrolled in the Inrolment Office, October,* 1845.]

To Bennet Woodcroft, *of Manchester, in the county of Lancaster, consulting engineer, for improvements in propelling vessels.*—[Sealed 13th February, 1844.]

This invention consists, firstly, in such a combination of the blades of screw-propellers with other suitable apparatus, as will enable the angle such blades form with their shaft to be changed from a less to a greater, or from a greater to a less angle, so that the best pitch of the blades may be obtained, for driving the vessel under varying circumstances, such as alterations in the speed of the vessel, in the depth of its immersion, and in the current of water or wind, or of both, in which it is acting. Secondly, in the combination of apparatus with the blades, by which they are held at any required angle with their shaft, or are moved from one angle to another. Thirdly, in the combination of an indicator with the above-mentioned apparatus and blades, to shew at what pitch the blades are adjusted. This invention may be applied to screw-propellers having any required number of blades; and such blades may be of any shape or dimensions, capable of being moved so as to alter their pitch; but the patentee prefers blades of increasing pitch, such as those for which he obtained letters-patent March 22, 1832.*

In Plate XIV., fig. 1, exhibits a portion of the stern of a steam-vessel with these improvements attached thereto; fig. 2, is an end view of the groove-box which slides upon and turns round with the propeller shaft, together with part of the apparatus for moving the same; fig. 3, is an end view of the screw shewn in fig. 1; and fig. 4, shews one of the blades of the screw detached. *a*, is the stern-post of the vessel; *b*, a

* For description of this invention see Vol. I. of our present series, p. 349.

false stern-post; *c*, a continuation of the keel from the real to the false stern-post; and *d*, a piece of iron which passes on each side of and is united to the parts *a*, *b*, *c*, to keep them fixed in their places. *e*, is thé propeller-shaft, extending from a bearing in the false stern-post *b*, through a stuffing-box in the stern-post *a*, to the driving-gear or engine by which it is turned. On the shaft *e*, is keyed a boss *f*, having four projecting bearings *g*, *g*, cast upon it; these bearings form an angle with the shaft *e*, corresponding in some measure with the angle formed by the bottom of the blades of the screw, which blades they assist in holding; the outside of each bearing is of a convex form, with a hole cut through it to admit of the arm *h*, attached to the shaft of the blade, passing through and traversing sideways as much as is required to alter the pitch of the blade; in the inside of each bearing is a semicircular slot, which, with a corresponding slot in the cap *i*, forms a circular bearing for the shaft at the bottom of the blade; and when the arm *h*, and blade *j*, are put in their places, the cap *i*, is bolted to the fixed bearing *g*, and the blade is thereby secured in its working position. *k*, is a grooved box, which is mounted upon the shaft *e*, and is connected thereto by the keys *l*, *l*, in such a manner that it will accompany the shaft in its revolution, but can, at the same time, be moved in the direction of its length. On the outside of the box *k*, are four oblique grooves *m*, *m*, which receive the circular heads of the studs *n*, *n*, carried by the arms *h*; and around the box another groove *o*, is formed to receive the ends of two studs *p*, *p*, on the lower extremities of two bell-crank levers *q*, *q*. The levers *q*, *q*, turn upon an axis *r*, carried by the bracket *s*, and are united by the links *t*, *t*, to the crosshead *u*; through this crosshead the rod *v*, passes, and is so attached to it as to turn freely round in it, and at the same time raise or lower the crosshead. The upper part of the rod *v*, passes through a short column *w*, upon the deck, and has a screw formed on it to work in the nut *y*, fixed inside the column; at the top of the rod is a wheel *x*, furnished with handles, by which the rod may be turned. *z*, is an indicator, consisting of a toothed segment, mounted upon a horizontal axis, and furnished with a finger or hand, which

moves in front of a graduated plate, to shew the pitch of the screw. 1, is a case, with a rack on one side, which gears into the toothed segment; this case rests upon the screw of the rod *v*, and a pin is passed through the rod directly above the case. 2, is a key, fixed inside the column, which enters a groove in the back of the case 1, to prevent the latter from turning round. 3, 4, is the water line.

The action of the apparatus is as follows:—When the rod *v*, is caused to descend, by turning the wheel *x*, it will, by means of the links *t*, *t*, and levers *q*, *q*, force the box *k*, along the shaft *e*, towards the screw propeller, and the curved grooves in the box acting upon the arms *h*, of the screw, will turn the blades to a less angle with the shaft, and thereby decrease the pitch of the screw. By reversing the movement of the wheel *x*, the box *k*, will be drawn away from the screw, and its grooves acting upon the arms *h*, will increase the pitch of the screw. The case 1, ascends and descends with the rod *v*, and its rack moving the toothed segment, causes the finger to indicate upon the graduated plate at what pitch the blades of the screw are adjusted.

The patentee claims the combination of the blades of screws, or blades which act as screws, with other apparatus, by which the pitch of such blades may be altered at pleasure, and indicated, as above described.—[*Inrolled in the Inrolment Office, August*, 1844.]

To THOMAS MOSS, *of Gainsford-street, Barnsbury-road, in the county of Middlesex, Esq., for improvements in printing and preparing bankers' notes, cheques, and other papers, for the better prevention of fraud.*—[Sealed 22nd April, 1845.]

THIS invention consists in so impressing patterns on the surface of paper used as bankers' notes, cheques, and other documents, on which designs or letters have been or are intended to be printed, that the paper so treated will be smooth on one side, whilst the other side will have a pattern indented thereon, so as to produce the appearance of a reticulated surface.

The apparatus employed consists of a pair of hardened steel rollers; one roller being plain, and the other engraved with the reverse of the pattern which is to be formed on the paper; and the engraved roller is pressed heavily down upon the plain roller. The paper being passed between these rollers will become indented with the pattern or design; and if the engraved roller be inked, as in surface printing, the indented pattern will at the same time be colored. It will be evident that if bankers' notes, cheques, and similar documents, having elaborate engraving or writing on one side, be subjected to one or both of these processes, so that an intricate pattern is impressed, with or without color, on the back of such engraving or writing, a document will be produced which will be much more difficult to forge than the same document without the impression; for, if an attempt be made to obtain a copy thereof, the inequality of thickness and compression of the paper, caused by the above process, would prevent any good impression or copy being produced; but even if a copy of the front of the document be obtained, the forger would still have to copy and reproduce the indented design on the back, which would be very difficult.

The patentee claims the mode, herein described, of obtaining additional protection against fraud, by causing bankers' notes, cheques, and other papers requiring similar protection, to be indented or impressed, and printed with indented designs, as described.—[*Inrolled in the Inrolment Office, October*, 1845.]

To WILLIAM BRINDLEY, *of Liverpool-road, in the county of Middlesex, paper manufacturer, for improvements in the manufacture of trays and other japanned wares, and various articles of japanners' and other ware, made of pulp.* —[Sealed 6th May, 1845.]

THIS invention consists in a mode of making trays and other hollow articles by placing a sheet of pulp, produced by the ordinary process of manufacturing mill-board, between suitable moulds or dies.

The mode of carrying out this invention is as follows:—

Into one of the ordinary moulds used by mill-board makers (consisting of a piece of wire-cloth, fixed in a frame, and having a border around it,) is poured a sufficient quantity of pulp to fill it to the level of the border, or as high as the intended thickness of the tray or other article may require; an upper mould or surface of wire-cloth is then placed on the pulp, and pressed down by means of a screw or other press, so as to cause the water of the pulp to flow through both the upper and lower pieces of wire-cloth. The sheet of pulp thus obtained (which, in the ordinary process of making mill-board, would then be placed between felts, and pressed,) is either at once placed between concave and convex moulds, suitable for making trays or other hollow articles, or else it is turned off the wire-cloth on to a flat sheet of iron, and the concave mould being then placed on the sheet of pulp, the whole is turned over, so as to deposit the sheet of pulp in the mould, which being done, the convex mould is laid upon the pulp, and pressed into the concave mould by hand, until the pulp takes the shape of the space between the two moulds; which are then, with the pulp between them, submitted to the action of a screw or other press, to expel the water. After this operation, the moulds are secured together, and placed in a stove, in order to dry the pulp; and the tray or other article is then finished in the ordinary manner.

The patentee claims the making of trays and other hollow articles from pulp, in moulds, by producing sheets of pulp, of the thickness desired, in the manner above described, and pressing and drying the same between concave and convex moulds, as above described.—[*Inrolled in the Inrolment Office, November,* 1845.]

To Joseph Hill, *of Ipswich, in the county of Suffolk, wire-worker, for improvements in manufacturing wire fabrics for blinds and other uses.*—[Sealed 6th May, 1845.]

The first improvement consists in giving a corrugated form to woven wire fabrics, in order to obtain greater stiffness, and thus render them more useful for making blinds, and for

other purposes. The corrugated form is imparted to the fabrics by passing them between grooved iron rollers. The size of the corrugations will generally vary from half an inch to three-eighths of an inch.

The second improvement consists in submitting woven wire fabrics to a process of embossing, so as to produce ornamental patterns thereon. A die is formed of brass or other suitable metal, with the pattern upon it in relief (the patentee prefers that no part thereof shall be capable of producing deeper impressions than one-eighth of an inch); over this is placed a sheet of "vulcanized India-rubber," about a quarter of an inch thick; and then, by means of a powerful screw-press, the wire fabric is pressed down upon the die, and the required embossing is produced. The employment of the India-rubber renders a counter die or matrix unnecessary; and the same sheet of India-rubber may, as it is plain, be used with different dies.

The patentee claims, as his invention, Firstly,—the manufacture of corrugated woven wire fabrics for making blinds and for other uses. Secondly,—the manufacture of embossed wire fabrics with ornamental patterns or devices thereon, for making blinds and for other uses;—also the application of vulcanized India-rubber for performing such process of embossing. —[*Inrolled in the Inrolment Office, November,* 1845.]

To Frederick Ransome, *of Ipswich, engineer, for improvements in combining small coal and other matters, and in preserving wood.*—[Sealed 10th May, 1845.]

This invention consists in the employment of a solution of silica or siliceous cement for combining small coal into blocks or masses, and for preserving wood.

The solution of silica or siliceous cement is made by dissolving 100lbs. of crystallized carbonate of soda in as much water as will make a solution of 1.150 sp. gr. at a temperature of 60°, and the soda is rendered caustic by the addition of lime; or, instead of carbonate of soda, 50lbs. of carbonate of potash are dissolved in the requisite quantity of water, and

rendered caustic by means of lime. This caustic alkaline solution is introduced, along with about 100lbs. of finely-broken flints or other siliceous substances, into an iron boiler or digester, and the mixture is kept for ten or twelve hours at a temperature of about 300° Fahr.. being at the same time frequently stirred. When sufficiently incorporated, the mixture is passed through a sieve, to remove any undissolved stone therefrom, and it is then evaporated until its specific gravity is increased to 1·500, at a temperature of 60°. The cement or solution is now fit for use; or, if too thin, it may be brought to the required consistence by evaporation, or by the addition of sand, or of calcined flints in a finely-powdered state; if too thick, it can be reduced with water.

The mode of combining small coal into blocks is, by mixing any suitable quantity of coal-dust or small coal with from $\frac{1}{20}$th to $\frac{1}{10}$th of its weight of the siliceous cement: this mixture is put into moulds, and subjected to hydraulic or other mechanical pressure; after which it is taken from the moulds, and allowed to dry at the atmospheric temperature for a few hours; and it is then placed in an oven or hot room. To effect the more perfect combustion of artificial fuel generally, as well as that prepared by the above method, the patentee forms one or more holes through each lump or block, for the free admission of air during the process of combustion; this is accomplished by inserting in the moulds one or more tapering plugs or cores, which are withdrawn after the fuel is compressed.

When treating timber, the patentee saturates or impregnates it with a solution of silica, in such a manner as to cement the fibrous part of the wood with the silica, so as to form a solid and durable mass. The wood is placed in an air-tight vessel, from which as much air is abstracted as is practicable, by an air-pump or other convenient means; a sufficient quantity of siliceous cement to cover the wood is then admitted, and, in order to cause the cement to penetrate further into the pores of the wood than would be effected naturally, artificial pressure is applied, by means of a pump; when removed, the wood is immersed in some acidulated or saline solution, which will render the silica insoluble.

The patentee claims, Firstly,—the cementing or combining small coal into blocks by the use of a solution of silica. Secondly,—the making of a hole or holes through each lump or block of artificial fuel, for the purpose of increasing combustion. Thirdly,—the cementing and preserving vegetable substances by the use of a solution of silica.—[*Inrolled in the Inrolment Office, November,* 1845.]

To CHARLES BLACK, *of Adam-street, Adelphi, gent., for improvements in the manufacture of horse-shoes.*—[Sealed 15th April, 1845.]

THIS invention consists in manufacturing horse-shoes of iron which is converted into steel by electric currents.

The patentee first manufactures the horse-shoes of iron, and then converts it into steel by the aid of electric currents, as described in the specification of letters-patent obtained by Dr. Wall, December 18, 1844.* The patentee wishes it to be understood that he does not claim this process of converting iron into steel; but only its application when manufacturing horse-shoes. Or, in place of first forming the shoes of iron, and then converting them into steel by the aid of electric currents, he sometimes first converts the bars of iron into steel by this process, and then makes shoes thereof.—[*Inrolled in the Inrolment Office, October,* 1845.]

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 285, Vol. XXVII.)

January 14th, 1845.

JAMES WALKER, President, in the Chair.

A PAPER was read on the different methods of fastening railway bars in their chairs, and a description of a new hollow wrought-

* See p. 29, of our present volume.

iron key, to be employed for that purpose, by W. H. Barlow, M. Inst. C. E. This consisted of an elliptical tubular piece, which, being passed in between the side of the bars and the chair, formed a sort of spring key or wedge, that kept the bars securely in their places. Mr. Brockedon presented a specimen of his vulcanized India-rubber, proposed as a substitute for felt, to be used between the sides of continuous bearing rails, or of the chairs and the sleepers of railways.

A description of an oblique bridge over the river Gaunless, on the Hagger Leases Branch Railway, Durham, by Mr. J. Story, was read.

On the first meeting of the Institution, the report of the council was read, giving a detailed statement of the affairs of the Institution, which were in a prosperous condition. Some alteration had been made as to the distribution of the business, and the publication of the transactions, which it was considered would be acceptable to the members. A statement was made of the memoirs and subjects to which the Telford and Walker premiums had been awarded, and a list read of the subjects for which Telford and Walker premiums were proposed to be given during the session.

The names of several of the late members, deceased, were mentioned, particularly that of Mr. Henry Robinson Palmer, F.R.S., V.P. Inst. C.E., who was instrumental in forming this Institution, and a slight memoir given of his professional life and works.

In consequence of new regulations proposed relative to the election of the officers of the Institution, James Walker, Esq. gave notice that he should avail himself of the opportunity of retiring from the Presidency.

January 21st.

ANNUAL GENERAL MEETING.

JAS. WALKER, Esq. delivered the following address, stating the reasons which had induced him to retire from the Presidency:—

"GENTLEMEN,

"IT has been usual for me, on occasions corresponding with the present, to address some general remarks on such subjects as respected the interests and economy of the Institution. On the present occasion my observations will be confined to what is more particular and in some degree personal; but in a matter of such importance as the change of your President, you will naturally expect some explanation from me, to account for the course I have thought right to adopt.

"In the printed list of names for office-bearers, which you have all no doubt received, the name of Sir John Rennie takes the place that since the death of Mr. Telford has been filled by mine.

"It is some time since the Secretary named to me that dissatisfaction had been expressed at my undefined continuance in the President's chair. From the distant residences of many of our members, and their slight knowledge of the affairs of the Institution, I paid very little attention to those observations, as a numerous and widely-spread society with perfect unanimity on all points cannot be expected.

"About six weeks ago this was repeated by the Secretary, and it appeared to me that something more was meant than was said. I told him so, and added that if he thought it at all worth the while, he had better bring the subject specially before the Council. I also reminded him, that I had on former occasions been desirous that my name should not be returned *alone* as President; and in case of my absence at the suggested meeting of Council, I requested him to say, that I would recommend the Vice-Presidents' and such other names as the Council might approve, to be added to the balloting-list for President. The Council met on the 23rd December. My absence in Scotland prevented my attending. On the 25th, the Secretary gave me an outline of what had been done; but referred me to the Chairman of the meeting, who had been delegated to wait upon me, in order to inform me. On the 26th the Chairman called. He told me, that there was a feeling in certain quarters, that the re-election of the same President for so many years amounted to a fixed Presidency, which was thought objectionable; that the members of Council present at the meeting were very sensible of the time and attention I had given to the Institution, and were desirous of meeting my wishes as to the mode in which my appearing to be the perpetual President should be avoided; that the plan suggested was, that I should be re-elected this session, during which a special meeting of members might be held for considering the constitution of the Council, when it would be recommended that I should go out by rotation at the end of the year; that the election of President should thenceforth be so conducted, that the office should not be held continuously by one individual for more than three years. I stated, that such proposal coming from the Council to me had somewhat surprised me; that the election being now annual, if I had not done my duty I supposed I should not have been re-elected) it being in the power of every gentleman to draw his pen through my name, and to substitute another name upon his balloting-list); that I had before wished and proposed other names being added by the Council to their list, but that I never had the idea of the gentlemen composing the Council being of the opinion that my removal at the end of one year was desirable, far less that they meant to propose a law which would make this imperative. I reminded him that the late president had been annually re-elected while he lived; that I had now held the office for ten years, and I asked him if there was any thing like want of success in the Institution, or indifference on my part, that had given rise

to this proposed reform. I said, that I thought my position in the profession, at the time I was first elected, had placed me in the chair by, I believed, the almost unanimous voice of the members, and that if the appointment had raised me higher, it ought to be considered that the honor was not reaped without labour and professional sacrifices; for that, since holding the office, I had never been seen in a court of law, nor in committees of Parliament, excepting on my own bills or for old employers; and that one of my reasons for recently giving up all railway practice was, the liability to be opposed to the engineers of competing lines.

"As to my being re-elected at the general meeting, I expressed my resolution not to be the means of a division in the Institution, nor to occupy the chair but with the entire approval and good feeling of the profession, which I had supposed I was enjoying.

"The Chairman's observations, and his replies to my remarks, were consistent with his known character for perfect candour and friendship, but as he has lately told me that he considered all but the message he had delivered to be private and confidential, I cannot refer to them.

"As to holding the office with the understanding that I was to go out at the end of one year, I felt that I must decline it, because I think I could not, after the recent circumstances, depend upon myself for taking that interest in it which its duties require. Therefore I have not lately considered myself as under the same restraint as before, but have entertained applications which might prevent my giving that personal attendance at the meetings, and that attention generally which hitherto I have not allowed any thing to interfere with. Again, were I to occupy the chair while the proposed changes are being carried into effect, I should be open to the suspicion of so managing as to throw difficulties in the way, for the purpose of keeping myself in the position I have filled for the last ten years, with, as I supposed, the cordial sympathy of every gentleman who had taken a share in the management. I therefore requested that my name should be withdrawn from the list, and I would strongly advise that, as you value an Institution in which we are all interested, you will join me in supporting the recommendation of the Council, and allow the experiment they recommend to be made.

"Personally I thank you all very much for the strong feeling that was expressed in my favour when the project of a change became known to you at the last meeting; indeed, when the *pressure from without* has been named, I have never heard, in any quarter, but of five gentlemen who were supposed to be applying it; but being told by the Council, that the feeling of dissatisfaction at my undefined continuance in office does exist, I am convinced that my remaining longer would be to sacrifice my own comfort, and to endanger the friendship of those whom I esteem, as well as the prosperity of the Institution."

The election of officers then took place, and Sir John Rennie, Knt., was appointed President.

February 4th.

Sir John Rennie, on taking the chair, delivered the following address:—

"Gentlemen,

"In succeeding to the Chair of this Institution, to which I have been elected by your suffrages, I feel that it is due to you as well as to myself to address you, which I shall do as briefly as possible. In the first place, allow me to return you my grateful thanks for the distinguished honor which you have been pleased to confer upon me; I can assure you that I feel it most deeply, and no exertions shall be wanting on my part to render myself worthy of the Institution and of your confidence. I am not vain enough to attribute your election of me to any merits of my own, for I see around me many who are far better qualified by their experience and talents to fill this chair. I must ascribe it rather to your kindness, and to the, I believe, universally acknowledged feeling in the profession, that this chair should not be constantly occupied by the same individual; but that there should be a rotation of officers, like the Astronomical, the Geological, the Geographical, and other modern scientific Societies, which have derived so much benefit from this principle; and that the chair should become an object of honorable ambition to every member of the profession. Of the propriety of this I believe there can be but one opinion, and the Council, who have laboured with such zeal for the benefit of the Institution, having been repeatedly urged by the leading members of the profession, as to the necessity of carrying this principle into effect, after mature and cautious deliberation, unanimously acceded to their views, and hence the origin of the present measures, which have received your approbation. In making the change, I have only to regret that you had not selected a more competent individual than myself; for in succeeding your late distinguished President, Mr. Walker, who has filled this chair for so long a period with such advantage to the Institution and such credit to himself, and whose universal kindness and urbanity have rendered him so deservedly popular amongst you all, I need not say how greatly I feel my own deficiencies; I must therefore throw myself upon your indulgence, and endeavour to make up by zeal and assiduity where otherwise I may be found wanting. The task is difficult, it is true; nevertheless, with your assistance, and the support of the Council (which I shall invariably endeavour to deserve), and with an ardent devotion and zeal for the welfare of the profession, I hope that I shall be able to discharge to your satisfaction the duties of the office of President. I will only add, that I shall always feel

it an imperative duty, as well as a source of real pleasure, to advance the objects of the Institution, and to be of service to any of its members.

"When we look around us and see the vast strides which our profession is making on every side, and the deservedly high place it holds in public estimation, we cannot but feel justly proud; for without the slightest disparagement of the pursuits or studies of other professions, I may confidently ask, where can we find nobler or more elevated pursuits than our own; whether it be to interpose a barrier against the raging ocean, and provide an asylum for our fleets; or to form a railway, and by means of that wonderful machine, the locomotive engine, to bring nations together, annihilating, as it were, both space and time; or to construct the mighty steam-vessel, which, alike regardless of winds or waves, urges onwards its resistless course; or to curb and bring within proper bounds the impetuous torrent, converting its otherwise destructive waters to our use and benefit, whether for navigation, trade, or domestic comfort; or the drainage of the unwholesome marsh, and converting it into fields of waving corn; or illuminating our cities with gas, changing, as it were, night into day; or the fabrication of machinery of endless form and ingenuity, by means of which every article which can tend to man's comfort and luxury can be produced in the greatest perfection, at the smallest cost; or to recover from the bowels of the earth nature's exhaustless treasures, and forming and preparing them to our use. In fact, we may almost say that there is nothing in the whole range of the material world, which does not come under our observation, or where the skill and science of the engineer is not required, in a greater or less degree, to render the bounties of Providence subservient to the good of mankind.

"With such splendid prospects before us, we have every inducement to stimulate our zeal, and to press us forward in the career of improvement. Thanks to our illustrious predecessors Smeaton, Watt, Brindley, Jessop, Huddart, Chapman, Telford (and I may with pride add to these the name of Rennie), and to our present distinguished members, much has been done, but still more remains to be done. With this excellent Institution (which has already achieved so much good) as our rallying point, in which all our energies should be centred, there is no doubt but that our exertions will be crowned with success.

"Our first object should be to render our meetings interesting and instructive, by the production of good papers on every subject connected, directly or indirectly, with the profession. Let us all contribute to the best of our ability and opportunity; those amongst us who may be too much occupied with the active duties of business to become authors themselves, may still be of the most essential service to the Institution, by communicating, in verbal discussion, those facts, as the result of their experience which they have not time to record; and by directing their

assistants to note and describe all interesting points, which are constantly occurring every day, more or less, in the routine of professional practice, and which are too often lost to the world and the profession, for want of being recorded.

"Let the junior members of the profession keep a regular journal of every thing which passes under their observation, and endeavour to classify the facts in such a manner that they may be enabled to deduce general principles from them, which may be applicable under similar circumstances; and let our non-professional and amateur members assist us by their liberality and support, by sending us original communications, books for the library, or models for the collection; but above all, let us be true to ourselves, and banish all other feelings except those of unanimity, harmony, and kindness.

"By these means this most excellent Institution will flourish and the great profession which we follow will, if possible, become still more elevated in public opinion; and we shall enjoy the proud satisfaction of knowing that by our united exertions the grand objects of the advancement of civilization, and the happiness of mankind, will be promoted."

A paper on the construction and regulation of clocks for railway stations, by Mr. Vulliamy, was read, and a clock placed on the table, the particular novel features of which were two sets of hands connected with the going parts of the clock, designed to shew the true time at the station, and also the time at London or elsewhere.

February 11th.

Sir John Rennie, President, in the Chair.

Specimens of timber from the new Terrace Pier, at Gravesend, were produced by Mr. Redman, in which considerable inroads had been made by the pipe-worm, "teredo navalis."

A description of the method employed for draining some banks of cutting on the London and Croydon, and London and Birmingham Railways, and on a part of the retaining wall of the Euston erection at the London and Birmingham station, by Mr. Hughes, was read.

A description of the Ouse Bridge, on the Hull and Selby Railway, by Mr. Bray.

February 18th.

Sir John Rennie, President, in the Chair.

A memoir of the canal of Exeter, from 1563 to 1724, by M. de la Garde, with a continuation by Mr. Green to 1830, was read.

February 25th, 1845.

SIR JOHN RENNIE, President, in the Chair.

"On the comparative advantages of the Atmospheric Railway System." By Peter W. Barlow, M. Inst. C. E.

THE author having been required to examine and to report upon the question of the comparative advantages of the atmospheric railway system, with a view to the propriety of its application to the Tunbridge Wells Branch of the South Eastern Railway, and as there appeared to him several results from the use of this mode of traction, which had not apparently been previously noticed, he was induced to lay his investigations on the subject before the Institution, in the hope that they might be found to contain some useful information, although the little time he was enabled to devote to it prevented his making any very detailed calculations.

In the application of stationary power to traction on a railway, by means of the exhaustion of air in a pipe, several of the inconveniences of the present mode of traction by a rope are avoided, and the great difficulty of rendering the pipe air-tight has been in a great measure overcome by the ingenuity and mechanical skill of the inventors. It is but fair to assume, in comparing the atmospheric system with traction by locomotive power, that still further improvements will be made in those features of the invention which relate to the mechanical construction.

Whatever may be the result of the comparison, in a pure mechanical point of view, that is to say, in a comparison of the cheapest and quickest mode of moving certain weights over a given distance, it must be considered whether the power required on railways generally is of that uniform character which admits of mathematical computation, and whether, by the adoption of the atmospheric or any stationary power, certain rules and regulations are enforced, which are inconsistent with the ordinary traffic on a railway.

On lines like the Greenwich or the Blackwall Railways, where the traffic is perfectly uniform, consisting of a certain number of trains daily, at stated intervals, the power admits of a mathematical computation; but on railways generally, the power required is liable to considerable irregularities; and a power, which is practically restricted to carrying between certain given points only, and at certain intervals, would lead to great inconvenience.

On all railways not carried upon arches, a great deal of work is requisite for the maintenance of the road and the works, which must be entirely intermediate traffic, consisting of bringing ballast and other materials to repair the road and works, the removal of slips, &c., and one or more engines are constantly employed for these purposes on all the principal railways. There is also traffic of coal and lime at sidings, to various intermediate points on all railways; and at the principal stations much manual labour is saved by the locomotive in moving goods, trucks, carriages, &c.

from the siding to the main line. The power for this purpose cannot be efficiently applied by the atmospheric system, because it does not admit of traction between intermediate points, except at a cost and inconvenience which would be inconsistent with practice, and must prove an objection to the use of atmospheric or any stationary power. This can be only surmounted by having locomotive engines for this purpose, and it involves a small, and consequently expensive locomotive establishment, renders necessary locomotive gradients, and consequently prevents the saving which, it is contended, can be made in the construction of the atmospheric railway, by the use of steeper gradients.

Another practical inconvenience, which will be found in the atmospheric railway, is, that the journey cannot be repeated on a length of pipe until after a given interval, which is necessary for forming the vacuum; the power is therefore not always at instant command, and the transmission of special trains and expresses is materially interfered with.

The same objection will also, upon consideration, be found frequently to interfere with the general traffic, at the stations where the up and down trains pass, as it is evident both must wait until the air is exhausted from within the pipes to the next engines. The length of this time will depend upon the extent of the pipe and the power of the engine; but it could not be less than six minutes, which is a serious loss of time to occur at the passing of every train, and on a long line, with trains every half hour, would reduce the average speed to twenty miles per hour. If the length of pipe to each engine was extended to ten miles, as has been proposed, this loss of time would be more serious, and would amount to twenty minutes or half an hour, unless very powerful engines were used.

Another important objection to the atmospheric railway is, that the traffic is dependent upon keeping air-tight a great length of pipe, and upon the perfect order of a great number of engines; in fact, it depends upon the perfect order of an extensive, delicate, and complicated machine, composed of an infinite number of parts, the failure of any one of which would render the whole machine useless; and it must be evident to any person practically acquanted with the maintenance of a railway, that the machinery of such an engine will be liable to frequent interruptions, from causes which it would be impossible to control.

The subsidence and slips of embankments and cuttings do not now interfere with the traffic of a railway, unless they are of great extent; because a line of rails, if injured, is soon replaced, in situations where the continuity of the pipe would be destroyed, and the traffic would be intercepted. Slips, which are not of sufficient magnitude to excite public attention, and which, in fact, do not interfere with the trains, are of more frequent occurrence, in wet weather, than is supposed, and will render the maintenance

of a pipe, in addition to the rails, not only very difficult and expensive, but in many cases impracticable.

There will also be another source of danger, from increased liability of the carriages to run off the rails of the atmospheric railway. The locomotive, from its great weight, runs over and destroys any impediment which may be on the rails, but which would throw off a carriage. Such impediments, it may be supposed, need not exist; but in spite of every precaution, they are found, in practice, to do so to a great extent. On many railways cattle are continually run over; tools or planks are frequently left by the workmen on the rails; such things are also frequently put on designedly; stones and flints also fall from the sides of the cuttings upon the rails. Such impediments are thrown on one side, crushed, or run over by the locomotive, but a carriage would be thrown off by them; and by a very small impediment the traffic on the atmospheric line would be stopped, and serious injury would, in all probability, be done to the pipe and machinery, which would require a considerable time to repair.

These objections to the system may be considered frivolous by those unacquainted with the actual maintenance of a railway; but the uncertain medium by which the traffic is maintained on the atmospheric railway will be fatal to its use for any traffic of importance. A person carelessly or maliciously disposed may, at any time, totally destroy the connection of the power; and it is well known how frequently this has been attempted on existing railways, and it would be oftener successful but that the attempts fail, from the great weight of the locomotive.

These remarks refer to long lines of railway, but the objections above stated do not apply to short lines like the Greenwich and Blackwall, constructed on arches, and in such situations, unless frequent intermediate stations are required; the system has undoubtedly advantages, from its superior quiet and speed, with light trains; and, as will be seen by the following investigation, it will also in such cases be comparatively more economical.

The question of the comparative cost of haulage, by the stationary and the locomotive systems, was thoroughly investigated when the locomotive engine was first introduced. It will be seen that in railways, where the trains are not numerous, the stationary power, in whatever way applied, is worked under a great disadvantage, from the small portion of time which is actually occupied in the passage of the trains on the length assigned to each stationary engine.

The irregularity of traffic on a long line of railway will be illustrated by the occasional necessity of removing large bodies of troops. The daily average traffic of several of the principal lines, very little exceeds the number of a full regiment of infantry; but it may be necessary to convey several regiments on the same day, and even at the same time; therefore, to meet such a contingency, it is evident the power must be so great as to work at other times at great disadvantage.

The actual lost power, in the locomotive engine, although considerable, is not so much as might be expected, the greater portion of loss being in the power required to convey its own weight and that of the tender; consequently, the amount of lost power is very much greater on lines with bad gradients, than on those with favourable ones, and on steep gradients the atmospheric principle is comparatively more advantageous, in a mechanical point of view.

It is necessary, however, to observe that a very common error exists in supposing that steep gradients are attended with comparatively little inconvenience on the atmospheric railway. They must, of course, render necessary the additional power due to the increased traction, which makes an important difference both in the first cost and in the working expenses. Thus in the gradient on an incline of 1 in 50, the sectional area of the pipe, and the power of the stationary engines, will be required to be four times that which is necessary on a level railway, and the working expenses will be increased in the same proportion; in fact, the cost of the apparatus, to give the requisite tractive power on a single line of railway of the above inclinations, would exceed the total cost of a double line, constructed for locomotive power. This result is very much at variance with the statements made in the first instance by the inventors, as to the great saving of cost in the first construction.

The result, that steep inclines are better worked by the atmospheric system, has been evidently arrived at without considering the cost of construction, which becomes practically a very important question in the atmospheric stationary power, from the large section of pipe that is necessary. The outlay, as well as the working expenses, will be increased nearly in proportion to the sectional area of the pipe, from the circumstance that the pressure is limited to that of the atmosphere, and this limitation of the pressure is a great practical objection to the atmospheric system; in fact, in comparing the atmospheric system with traction by the rope, the latter will be found to have much the advantage with steep gradients, and experience will show that the atmospheric system is practically much better adapted to level lines of railway, than to those with steep gradients, which, if exceeding the inclination adapted to locomotive power, will be worked more advantageously by the rope. There are, however, few instances in which the inclines are required to be so steep that the locomotive cannot be more advantageously applied; and the fact of the abandonment of stationary power for the locomotive, on the inclines on the Manchester and Leeds Railway, and on the Edinburgh and Glasgow (the inclination of both being greater than 1 in 50), as well as in other cases, is not only a proof of the improved capability of the locomotive engine, but of the inconvenience found in practice from stationary power.

The objection which will interfere most sensibly with the adop
tion of the atmospheric system, is the necessary outlay in the er

gines and the pipe, and this seems to have been lost sight of in the calculations of the economy of working, which have been made by its advocates.

Referring to the calculations of the cost of working on the London and Birmingham Railway,—to lay down the apparatus of a double line, with a pipe of the required area, would not be less than £10,000 per mile, or a total cost of £1,120,000; and the interest of this sum, at 5 per cent., will be £56,000, or £500 per mile, or a sum very nearly equal to the actual cost of working that railway by locomotive power, and exceeding the average cost of most of the long lines. In fact, there is no doubt that respectable contractors could be found, who would supply locomotive power, and work any railway, for the interest of the sum which would be expended in laying down the atmospheric apparatus.

If the interest on the necessary additional outlay is equal to the cost of working by locomotive, it is evident that it cannot be applied to main lines already executed, even if the working expenses were entirely saved.

It has been stated, that an economy may be effected in the cost of the construction of the tunnels and the bridges, by avoiding the use of the engine; but this is erroneous, as the dimensions are governed by the size of the goods trains, the carriages, and the trucks, and not by the engine.

A calculation has been made showing a reduced cost of maintenance of the permanent road; but experience has shown that in this department any calculation must be so completely vague, as to be totally without practical utility.

The chief cost of maintenance of way on ordinary lines is from the settlement of the embankments; and on new lines it is sometimes extremely difficult to prevent an interruption of the traffic, during the winter, from the sudden and irregular settlement which a few hours may produce. On recently made embankments it would be found extremely difficult to keep in order the road with the atmospheric pipe, and it could certainly only be done at a very increased cost.

It may be argued, that as the weight of the engine running over the road is avoided, less repair will be necessary. In cuttings, some saving might be expected from this cause, if there was no pipe in addition, but with this addition, and on a line with the ordinary proportion of embankment, it is to be apprehended that the cost of maintenance will become a serious expense.

From these observations, the following general results have been arrived at:—

1st. That the situations best adapted for the application of the atmospheric principle are on lines where the trains are required to be numerous. This must generally occur near towns, and in such cases, additional advantages would be derived from the absence of the noise of either the locomotive or the rope, and such lines might also generally be constructed at less cost by the adop-

tion of this mode of working, so as to pay for the additional expenditure.

The circumstance of a railway being throughout on one inclined plane, so that the carriages will run down with their own gravity, as on the Dalkey line, is favorable to the atmospheric system.

The locomotive system would, however, also derive advantage from the same cause, as the enginc would return without using any steam.

2ndly. That on any main line, with the average number of trains, the interest on the cost of the atmospheric apparatus amounts to the present actual annual cost of working by locomotive, and consequently it cannot be applied to any line or branch worked as part of the same locomotive establishment, without an actual annual loss, amounting to nearly the whole cost of working the atmospheric engines.

It must also be evident that it can never be applied to new lines, under ordinary circumstances, without actual loss, as no reduction in the cost of the pipe can be made by the alteration of the gradients. If the mode of rendering the pipe air-tight could be improved, so as to work lengths of ten or fifteen miles each with one engine, it would much reduce the loss of power; but these lengths would cause several practical inconveniences, if they could be obtained.

3rdly. That a great cause of lost power arises from all modes of working a railway by stationary engines, inasmuch as the steam must be kept up the whole twenty-four hours; while the locomotive power is practically required for a few hours only. This will amount, assuming the average number of trains on railways, to three or four times the consumption of fuel by the stationary principle. It may be said, that when applied to long lines, a greater number of small trains would be run, instead of a few large ones; and this would certainly be the best plan. How far the increased traffic, arising from these facilities, might pay the additional cost, it is impossible to say; but with any number that can be run with advantage, the locomotive would be the least expensive method, unless under peculiar circumstances. There is also another objection arising from the amount of work which is required to be done at stations by locomotives, and also the intermediate work of various kinds; this, with the atmospheric system, must be done by horse or manual labour at a much increased cost.

There is also the risk of certain stoppages of the traffic with the atmospheric railway, not only from the stationary engines getting out of order, but from the frequency (with every care that can be employed) of obstacles on the road, which will throw a carriage off the rails; injury to the pipe by slips and subsidencies, &c. These are of frequent occurrence in embankments, and in a common road they can be repaired in a few hours, but they would be sufficiently extensive to entirely destroy the action of the pip and would stop the traffic for a considerable period.

with advantage, and the objections only applied to a limited ex-

4thly. The most favorable feature in the atmospheric plan is the avoiding of the noise both of the locomotive and the rope, and this will lead to its adoption on short lines in the neighbourhood of towns, as it will be less objectionable to the residents in the neighbourhood; and in these cases, as the trains are required to be numerous, and locomotive power on the small scale becomes comparatively costly, the advantages of economy will also be in its favour: in other words, in such cases, where stationary power has or may have been previously used with economy, the atmospheric mode of traction would be advantageous; but whatever improvements may be made in its construction, it must still possess the essential features of the stationary principle, and must therefore, as has been previously shown, not admit of application to a railway of general traffic.

The attainment of lengths of ten miles each would evidently reduce the great cause of loss of power in the present atmospheric railway, but it would increase the inconvenience which must arise on long lines, from the absolute necessity of intermediate power; and where two trains meet, it is evident they must both wait during the time the air is exhausted out of ten miles of pipe, which will not be less than twenty minutes, or half an hour, unless stationary engines of very large power be used.

The result, as to the effect of the resistance of the air at high velocities is very interesting. It has been shown by experiments, that when a train attains a velocity of 35 miles per hour, the resistance from this cause equals 50 per cent. of the tractive force, and that it increases rapidly with higher velocities; this is fully proved by the effect of windy weather on passenger trains; but it is remarkably illustrated by a circumstance which occurred on the Canterbury and Whitstable Railway, since it has been under the author's charge (and it appears to have been of frequent occurrence). A train was entirely stopped in descending a gradient of 1 in 50, rendering it necessary to use horse power, although the velocity of the wind at the time could not have exceeded 60 or 70 miles per hour.

The result arrived at, that the average speed on a single line would be reduced to 16 miles per hour in practice, from the pipes being full, at the meeting of the trains, confirms the author's estimate of 20 miles per hour; and it appears also to be shown so clearly as to admit of no doubt, unless the advantage of frequent trains be abandoned. It is impossible, therefore, not to look with great interest on the experiment of the South Devon line, where it is anticipated that more than double that speed will be realized.

With reference to the lines on which the atmospheric system is in course of execution, viz., the London and Croydon, and South Devon, the results arrived at in the above investigation show that the London and Croydon (if not forming a portion of a trunk line), is a case in which the power can be comparatively applied

tent, as the trains are frequent, and the traffic consists chiefly of passengers, and as there need be only one train met, the speed with a single line will probably be greater than with the locomotive engine, from the time necessary, with frequent stoppages, to get the locomotive engine up to its speed.

The New Cross incline will be felt to be the greatest objection, as the speed will be small (with the power proposed), with large trains, from the increased tractive force which will be necessary.

The South Devon line is a case to which it would appear from the above results that the atmospheric system is not adapted.

Mr. Joseph Samuda must be permitted to say, that he thought the author of the paper had scarcely entered fairly into the examination of the system, as the statement was made up entirely of the demerits of the plan, without giving it credit for the success which had already attended its first establishment. Several of the objections were made, evidently without a knowledge of how the apparent difficulties in the application were proposed to be overcome, or were actually avoided. He would instance only a few points, and leave to others, better qualified than he was, the task of refuting the charge of impossibility.

It was not proposed to use any other than the engines of the main line, for working the sidings, which could be laid in without at all interfering with the continuity of the main line. Level crossings were quite as practicable as on locomotive lines. There was even an additional security, as by a simple contrivance, consisting of a cylinder and piston connected with the main pipe, the platform, which, when down, formed the protection of the valve under the crossing, could be raised when the vacuum was being formed, and thus not only became a signal that a train was about to pass, but also formed a barrier for preventing any thing from traversing at an inopportune moment.

He could not understand the necessity for bringing two trains together, as had been assumed; but if that did occur, a little extra power might be used in that particular instance, in the same way as in an emergency, another locomotive would be added to the ordinary train engine.

As respected the liability to be thrown off the rails by impediments, he must contend that the position assumed was not supported by facts. On the Dalkey line there were curves of 130 yards radius, which were constantly traversed at a speed of thirty-five miles per hour; yet no accident had occurred. It was well known that locomotive engines were not in the habit of traversing curves of that radius at such a speed.

He could not agree with the statement of the comparative cost of the two systems. He thought that the author had underrated the actual cost of locomotive haulage; while he had overrated

not only the cost of that by the atmospheric system, but also the amount of power employed; for instance, with a gross load of seventy-five tons not more than two-thirds of the actual power of the engine were employed, as was shown by the indicator diagrams.

In the statement of the cost of construction, Mr. Samuda's experience was equally at variance with the assertions of the author.

As regarded the probable expense of the maintenance of the way on new atmospheric railways, it must be remembered that the Dalkey line was quite new, but it had worked through the winter without any stoppage either from subsidence or from slips, and it was kept in order with as little difficulty as the part which was worked by locomotive engines.

It should not be assumed that the system was not susceptible of modification, to accommodate itself to any amount of traffic. Mr. Samuda must, on the contrary, assert, that any economical arrangements which were practicable with the locomotive system might be adopted with the atmospheric plan. For instance, if it was found desirable to have trains at long intervals, the obvious plan would be, to substitute for a powerful engine a small power, to pump water into a reservoir, which, during the time necessary for forming the vacuum, should exert a considerable power upon a water-wheel. The system was capable of being economically adapted to almost any locality where there was sufficient traffic to warrant the formation of a railway.

Mr. P. W. Barlow stated, that his object in presenting the paper to the Institution, was not to attack the atmospheric system, but simply to suggest, for the consideration of the members, certain objections with reference to it, which appeared to him proper subjects for discussion.

As to the sidings, he did not contend that it was impossible to apply them in a mechanical point of view, but that they would lead to great inconvenience, and be inconsistent with practice. It could only be done (unless the crossing were divided) by raising the piston above the level of the rails, which would be inconvenient, from want of space under the carriages.

With reference to the comparative advantage of obtaining ten miles of pipe in one length, it would be desirable in one respect, as permitting a less number of stationary engines, and as saving working expenses; but it would be objectionable, inasmuch as it would increase the loss of time which necessarily occurred when the trains met on a single line, from the time requisite to exhaust the air out of the pipe to the next station, which would require twenty minutes.

Mr. Pim professed a high respect not only for the speculative views of the theorist, but also for the examination of the practical man; but he thought that the theory of subjects like the present should not be examined until after careful observation of the actual practical working of the system, as it was notorious how the results of the soundest theory were modified by a slight

alteration in the practical condition of the machine or system. It was to be regretted that the author had not made himself better acquainted with the results obtained on the Dalkey line, where any information he required would have been readily afforded to him. He would then have seen that several of his objections did not, in fact, exist. It would suffice to mention a very few. The leading carriage being tied down to the line by its connexion with the piston, was sufficient of itself to prevent any tendency to run off the rails, even on the sharpest curves. On one occasion, owing to the carelessness of an attendant, the leading carriage, with the piston, became detached from the train, and travelled up to Dalkey in perfect safety, at a velocity of nearly seventy miles per hour. There were many omissions in the paper, which savoured somewhat of a strong bias against the atmospheric system. The degree of speed which could be attained, with such safety, was not noticed. There was not a word as to avoiding the chance of collision, when it was notorious that a collision was utterly and physically impossible. In stating that the dimensions of the tunnels were regulated by the height of the pile of goods on the luggage trains, it did not appear to have struck the author that it was possible to reduce that height, and, at the same time, to carry as great a load in a more advantageous form. Mr. Pim was of opinion that the introduction of the atmospheric principle would produce an entire change in railway traffic, as it would be found that frequent and light trains were more advantageous, both to the railway company and to the public, than heavy trains at long intervals. The public would very soon have an opportunity of judging practically as to the merits of the system, and his confidence in its advantages was not at all shaken by the statements he had heard in the paper. On the contrary, he had much more confidence in the results which he felt assured would be attained by the skill of the two able engineers, who were then constructing lines on the atmospheric system.

Mr. P. W. Barlow said, the practical results of the working on the Dalkey line shewed that the tractive power of the stationary engine, as applied by the atmospheric pipe, was about equal to that of an ordinary goods engine used on railways; or the same amount of work could be performed in the same time by one of those engines, and that the consumption of fuel, during the actual motion of the train, was at least equal to that used by the locomotive, which was 40lbs. per mile; consequently, with the loss from obtaining the vacuum, and constantly keeping up the steam of the stationary engine, no economy in working could be obtained, under any circumstances, unless greater perfection were obtained in the application of the atmospheric principle; and it was doubtful if the Dalkey line, with its advantageous incline and numerous trains, could not be more economically worked by locomotive engines.

Mr. C. H. Gregory said, that without wishing to depreciate Mr.

Barlow's interesting paper, there were some points in it, not noticed by previous speakers, which, he would submit, required correction. Mr. Barlow had stated that, in the comparison he had instituted, the atmospheric engine had consumed 40lbs. of fuel per mile, and that an equal weight was consumed by a locomotive goods engine, under similar circumstances; but it did not appear that any allowance had been made by him for the difference in cost between coal used in the atmospheric and coke in the locomotive system. He thought, too, that a comparison between the two systems ought to include a notice of the great difference between the wear and tear of locomotive and stationary engines, which would be much in favour of the latter. The comparison had been made between the working of the two systems at a slow speed, which he believed was not so favorable to the atmospheric system, where a greater speed would shew comparatively greater economy, while it was well known that high velocities induced a great loss of power in locomotive engines. In illustration of this fact, he alluded to some indications which had been taken by M. Gouin, a French engineer, in the cylinders of locomotive engines at different velocities. In these it was shewn, that when the engines were running at slow speed, nearly the whole pressure of the steam had been effective in the cylinders; while, at high speeds, the indications showed a loss in the cylinders alone amounting to about 50 per cent. of the pressure. This result was in addition to all the acknowledged mechanical defects of locomotive engines at high velocities.

Mr. P. W. Barlow explained, that he did not contend that high velocities could not be obtained on short lines, or between stations; but on long lines, when the trains met, each train must wait until the air was exhausted out of the next length of pipe, which would reduce the speed, in practice, to 20 miles per hour.

Mr. I. K. Brunel did not appear either as a supporter of the atmospheric system, or as wishing to condemn it; but he thought it due to the inventors, that those who were about to use it should not be entirely silent. The paper appeared to him rather a list of objections to the plan, than an examination of its comparative value as a method of propulsion; and he must say that these objections did not seem to be supported by calculation, or by argument. Mr. Brunel was quite prepared to admit that there were many situations to which the system, in its present state, was inapplicable; but, as a practical man, he clearly perceived the manner of remedying many of the alleged defects; and, without that feeling, he should have had considerable hesitation in recommending its adoption. He thought also that many of the presumed deficiencies did not really exist; for instance, upon the atmospheric line now being established in Devonshire, there would be numerous stations, in which he anticipated doing all the station work with as much facility as with locomotives, and even more conveniently. He did not anticipate any difficulty in trans-

mitting special trains and expresses, but, on the contrary, he believed that the impossibility of collision would induce peculiar facility in that respect. He thought that, instead of the stoppages reducing the average speed below that of locomotives, say to twenty miles per hour, double that speed would be certainly attained. He could not agree that because the system had hitherto only been practised on a short line, it was inapplicable to long lines; calculations proved the reverse, and it would be only just to await the result of the practical working of the lines now in the course of execution. He was of opinion, that by the use of large boilers, fixed on the most approved plan, by husbanding the power, working the steam expansively, and using the present known improvements in stationary engines, the system would prove as economical as it was free from danger.

Mr. Cubitt, V. P., thought that any assertions as to the capabilities or powers of the system were, in its present state, very inconclusive, and scarcely fair, and the best manner of confuting the positions of the paper was to have a line at work, which would, he hoped, be accomplished without much delay. He must, however, be permitted to say, that the mechanical difficulties of the level crossings, sidings, &c., were met by simple mechanical means. The real questions were the first outlay, and the cost of working, and they could only be decided by actual experience.

Mr. John Scott Russell was neither a prejudiced adversary nor a headlong advocate of the atmospheric system. He agreed in the opinion already expressed, that any discussion on points which were soon to be submitted to the test of experience, was of comparatively small value. One important service, however, had been already rendered by the discussion, in having elicited the statements of two eminent engineers, who were then engaged in carrying out the practical application of the atmospheric principle on a large scale. They had stated that all those difficulties which had been mentioned in the paper, had been foreseen by them, and had been conquered. This fact was important, for it was most desirable that any opposition to the atmospheric system should be based on right grounds, and not upon mere prejudice. The paper had pointed out, with much ingenuity, the minor practical difficulties in the way of the execution and the use of the atmospheric railway; but these he did not at all regard as objections to the system, but merely as the statement of problems, of which the ingenuity of the promoters, in constructing the works, had to invent the solution. Now, he thought it only fair to say, that seeing the atmospheric system in the hands of such mechanics as Mr. Cubitt and Mr. Brunel, he had no hesitation in expressing his conviction that they must have seen their way clearly to sound practical solutions, for all their mechanical difficulties, or they never would have risked their reputation on the construction of such lines. Although he was himself much inferior to them as a mechanic, he could see his way clearly to the solution of many

of the difficulties stated in the ingenious paper of Mr. Barlow, and he had such faith in the powers of invention of the engineers of this country, and in the mechanical skill and powers of execution of the workmen, that he had no doubt, if the atmospheric system was sound at heart and in its principle, all these minor evils would disappear. On the faith, therefore, of the talent of these engineers, he would give the system credit for all that their skill could devise, and he had no doubt they would overcome the mechanical difficulties of the practical execution. But there remained the great question of the value of the system, as a general system of traction, applicable on all railways, and capable of superseding the locomotive engine. It was on this general ground that the question must be decided, and here the result, he thought, was perfectly clear. The atmospheric system was merely one among many modifications of stationary power. As such, while it possessed the advantages it must encounter all the evils of the stationary system, and on this broad ground, that the stationary system was neither so economical nor so convenient as the locomotive system, he rejected the proposition of the inventors, who wished to substitute stationary atmospheric for locomotive engine power generally on railroads. But, in justice to the system, and to those who had adopted it, he ought to say that he had no doubt that, in cases where stationary power was desirable, there were circumstances which might render the atmospheric system peculiarly appropriate. Selecting, for instance, a line where there were many or sharp curves, or many inclines of variable and steep gradients, and where also the trains were numerous, uniform in magnitude and number; such a case was most favourable to stationary power, and to the atmospheric system especially. He thought it would have been wiser if the inventors of the system had brought it forward as an expedient of this kind, suited to these circumstances, rather than as a revolutionary system, proposing to displace locomotives on all the great railways of the country. In that case, they would have received the support of many who now could not accord with their views. In that modified application he would be happy to see it successful, and he thought the wiser promoters of the system were of his opinion, for it was in peculiar circumstances, of the nature he had indicated, that they were about to introduce it, He should be glad to learn from those engineers who were about to introduce the system, whether they would assure him, that in the application of the system there was no loss incurred in the use of the air as the means of applying the power. He conceived there must be a mechanical loss of power in the process of first rarefying the air, and afterwards condensing it.

Mr. Pim said, that it was not for him to enter into an analysis of the theory of the atmospheric system, but his belief in its correctness was in a great degree confirmed by the investigation of Dr. Robinson, of Armagh, who had arrived at diametrically opposite

results from Mr. Russell. He could, however, judge of the practical results; and when comparing the actual speed and cost of propulsion on the Dublin and Kingstown railway, with that of the Kingstown and Dalkey line, the result was decidedly in favor of the latter; on the former, with locomotive engines, ¾ mile, with a rise of 13 feet, was traversed in 4 minutes; while on the latter, with the atmospheric system, 1 mile, with a rise of 71½ feet and several sharp curves, was passed over in a little more than 3 minutes: the consumption of steam in the Dalkey engine was, at the same time, much less than in a locomotive.

Mr. Cubitt, V. P., thought that it was not incumbent on the advocates of the system to shew that it was perfect as a mechanical power. It sufficed to show that it was superior to fixed engines and ropes, which had been attempted to be substituted for locomotives, not only on account of their cost of steam and fuel whilst travelling, but also because of their excessive wear and tear. If, as had been asserted by a great railway authority, the power required to move the engine and tender equalled that requisite for drawing fifteen passenger carriages, which was more than an average train, it would follow, that it would cost more to move the engine and tender than the average of all the passenger trains. If, therefore, the traffic could be conveyed by the atmospheric system at a less expense, a great point would be gained.

Mr. J. Scott Russell gathered from what Mr. Pim had said, that it appeared from Dr. Robinson's calculations that the power expended, aud the power usefully applied, were theoretically precisely equal. Mr. Russell had not arrived at the same conclusion, and he would desire to ascertain whether the engineers intending to use the system, and who had doubtless examined the subject carefully, agreed with Dr. Robinson's view, or entertained a more modified opinion of it.

Mr. J. Samuda could not admit Mr. Russell's view of the loss of power. He contended, on the contrary, that the power primarily expended in forming the vacuum was returned during the passage of the train. When the air-pumps were working at 15 inches of mercury, with a pressure of 4½lbs. per square inch on the piston of the steam cylinder, a power was attained in the pipe equal to 7½lbs. per square inch upon the travelling piston.

Mr. I. K. Brunel contended also, that a loss of power to the extent that had been stated, could not be proved, when a certain amount of work was performed, with the expenditure of a certain power. He would admit that some loss might arise from the absorption of heat, during the process of rarefying the air in the main, but he could not concur in the position assumed by Mr. Russell.

Scientific Adjudication.

COURT OF CHANCERY.

Before Sir L. Shadwell.—November 4th, 1845.

RUBBERY *v.* BARRS.

Mr. Bethell, Mr. Teed, and Mr. Tooks, were for the plaintiff; and Mr. Stuart and Mr. Webster for the defendant.

This was a motion on behalf of Mr. Rubery, the patentee of certain improvements in the manufacture of "top tips" for umbrellas, for an injunction to restrain the defendant, Mr. Barrs, who is a manufacturer at Birmingham, from making or selling a top tip which was alleged to be an infringement of the plaintiff's patent. The improvements were represented to consist in a novel method of manufacturing those parts of the furniture of an umbrella called the top tips, which are placed upon the end of the whalebone, and fit into the wheel, having a wire passed through holes made in them for the purpose of forming the joints upon which the ends of the ribs turn in opening and closing the umbrella, the plaintiff's method being to compress the sheet metal out of which the top tip was composed, by means of dies and punches, so as to form it to the required shape for fitting into the notches of the wheel, without the necessity of drilling or turning in the manner required by the old method, when it was manufactured out of solid metal. The plaintiff brought an action in 1841 to establish the validity of his patent, and in 1843, when the action was tried, the jury found that as to some portion of the patent the invention was new and useful, but that the use of the die, which formed another portion, was not new. But a verdict was entered for the defendant. Upon this the plaintiff obtained the permission of the Attorney-General to disclaim the frail parts of his patent, and he now sought to obtain an injunction to restrain the violation by the defendant of what remained of his invention through the operation of the disclaimer. The discussion now raised was upon the effect of the singular verdict of the jury, and the disclaimer; and the point contended for was, whether there should be any injunction issued until another verdict could be obtained, as it was admitted the matter must be tried again.

The Vice-Chancellor said that it was an entirely new case, and the difficulty arose out of these circumstances:—At the trial, the jury, on some of the issues, had found that the invention was not new. Now, at that time, the plaintiff had claimed a right to three things, but it did not follow that because the invention was not new as to three, that it was new as to one. With respect to the statement of the jury, it would be a most dangerous precedent to take the explanatory language of the foreman as having the effect of a legal judgment. The jury had to find on a specific fact, but

they could not make other facts a part of their finding. The true way was to disregard the statements of the jury, except as to their finding on the record. The Court could not be bound by any idle talking of the judge and the jury, so as to say there had been an infraction of a valid patent. There was no complaint against the responsibility of the defendant, and therefore the right course would be, should the jury decide in favor of the patent, to direct that an account should be kept, and not to stop the defendant from doing what, for aught that yet appeared, he might be entitled to do. The order should be made in the common form, that an issue should be tried at law.

REPORTS OF AMERICAN PATENTS.

From the "Journal of the Franklin Institute,'

EDITED BY DR. THOMAS P. JONES.

To Benjamin H. Brown, *Philadelphia, Pennsylvania, for a machine for making bricks from untempered clay.*

The clay, as it is taken from the bank, is deposited in a hopper by elevators, and from the hopper it passes between two rollers that move with different velocities, by which it is drawn through in thin cakes, and thrown on to a set of permanent teeth, and there cut up by the action of sets of teeth on a roller that work between the permanent teeth. It is then conducted by a spout into a moveable mould, which, when filled, slides under a piston actuated by a cam, to be compressed and formed into a brick, which is then discharged by a follower actuated by another cam that forms the bed of the mould.

Claim :—"I do not claim the use of the cams for operating the pistons in pressing brick, nor do I claim the manner in which the bricks are received, compressed, and delivered; but what I do claim as my invention, and which I desire to secure by letters-patent, is the arrangement of the two cams for effecting the pressure and delivery of the bricks, in combination with the pistons and moveable mould. I also claim the combination of the rollers and pins for pulverizing the clay as above described."

To William Francis and William Johnson, *Waynesville, Haywood County, North Carolina, for a mode of marking and lettering packages.*

The patentees say:—"The nature of our invention consists in running a composition of glue or molasses (with other materials if deemed necessary to elasticity and preservation) into moulds

of letters, figures, and devices, &c., formed on lines, upon which (while in a warm state) is applied thin slats of wood or other substance, of the width of the lines, with bevilled edges, which adhering to, is drawn with the composition from the moulds; when said composition becomes properly cooled, the moulds being previously oiled, these slats, when cut or separated between the letters, form type. The type when made are placed in the order required on a hand press formed of bars of wood or other material, with wire or other springs placed at regular distances fastened on said bars, on the top or surface of which said springs are attached small blocks of wood or other material, forming a smooth level surface, on which are placed the type, and fastened by means of slides or otherwise, the springs admitting the type and blocks on which the type are placed, to play in a groove formed in the bars of the press, for the purpose of giving way when the face of the type touches an uneven surface, or until the whole surface of the type, and that of the package or article marked, come in complete contact with each other."

Claim:—"What we claim as our invention, and desire to secure by letters-patent, is the hand-press constructed as herein described, and, in combination therewith, type formed of an elastic substance, composed of glue and molasses, or other material, when deemed necessary; to be used by means of said presses, with the aid of springs or other similar means, and other fixtures, as herein described, so as to ensure the successful application of the type to even or uneven surfaces, using for that purpose any material or compound that will produce the intended effect."

To Rudolph Miller, *York, York county, Pennsylvania, for improvements in the machine for cutting and crushing corn fodder.*

The cutting part of this machine is similar to a straw-cutter with the knives attached diagonally to two heads on a shaft, the fodder being fed up by fluted rollers. The cut pieces pass from the cutting part to a roller armed with teeth which pass between similar teeth in a concave, and are thus crushed.

Claim:—"Having thus described the manner in which I construct my machine for cutting and crushing corn fodder, and shewn the operation thereof,—what I claim therein as new, and desire to secure by letters-patent, is the manner in which I have arranged and combined the cutting, and the crushing, or rubbing, apparatus, substantially as set forth."

LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

1845.

Oct. 28. *Green and Bentley*, of 27, Upper George-street, Bryanstone-square, London, for a syphon chimney funnel.

28. *Andrew Symington*, of Kettle, and *Alexander Temple*, of Falkland Palace, for an improved clock.

29. *Henry Worthington and William Bullough*, of Eccleshill, near Blackburn, for a lathe sword, with moveable stop-rod.

31. *William Thorowgood and Robert Besley*, trading under the firm of *William Thorowgood & Co.*, of Fann-street, Aldersgate-street, London, for English Clarendon.

31. *John Jones*, of Leeds, for an excavating tool.

Nov. 4. *John Inderwick*, of 58, Prince's-street, Leicester-square, for a galvanic pipe.

5. *Gouger and Mayer*, of 2, Bow-lane, for a stock and shirt collar.

5. *Henry Methold Greville*, of Northampton, for a spirit torch.

6. *George Macfarlane*, of 41, Gerrard-street, Soho, London, for a cornopean or cornet-à-piston.

7. *Newcombe and Mansell*, of 35, Wapping, Liverpool, for a reflecting luminator for astronomical and other purposes.

7. *Thomas Williams*, of Market-place, Willenhall, Staffordshire, for a lock.

7. *William Palmer*, of 144, Western-road, Brighton, for "The Brighton Shower Bath."

7. *John Aston*, of Birmingham, for a design for the shape or configuration of the back of a button.

8. *Edwin Heinke*, of 103, Great Portland-street, Oxford-street, London, for a diving helmet.

10. *Peter Scott*, of 9, South Bridge-street, Edinburgh, for an improved shirt, called "The V shirt."

10. *Charles Sheaf*, of New-street, Birmingham, for a candlestick.

Nov. 10. *Peter Mark Roget, M.D.*, of 18, Upper Bedford-place, London, for the Stereotic chess and draught-board.

19. *Daniel Hodson*, of 27, Gun-street, Spital-square, Middlesex, for a silk polisher.

19. *Thomas Benbow*, of Camden-street, Birmingham, for a fastening for bandages and stays.

25. *Alexander Guthrie*, of 54, New Bond-street, for "The Gilet du Prince."

List of Patents

Granted for SCOTLAND, subsequent to October 22nd, 1845.

To John Campbell, of Bowfield, Renfrewshire, bleacher, for certain improvements in the apparatus or machinery for drying or finishing of bleached cotton or other goods.—Sealed 24th October.

James Higgins, of Salford, machine-maker, and Thomas Schofield Whitworth, of the same place, mechanic, for certain improvements in machinery for preparing, spinning, and doubling cotton, flax, and similar fibrous materials.—Sealed 24th October.

Arthur Smith, of St. Helen's, Lancashire, manufacturing chemist, for certain improvements in the manufacture of soda ash.—Sealed 28th October.

Thomas Moss, of Gainsford-street, Barnsbury-road, London, engraver, for improvements in printing and preparing bankers' notes, checks, and other papers, for the prevention of fraud.—Sealed 29th October.

John Samuel Templeton, of Sussex-place, Kensington, London, artist, for improvements in propelling carriages on railways.—Sealed 29th October.

Robert Clark, ship's painter, and Alexander Pirnie, ship's smith, both of Newburgh, Fifeshire, for certain improvements in steering vessels.—Sealed 29th October.

John Ayre, of Tynemouth, county of Northumberland, sail-maker, for an improved fabric for sail-cloth.—Sealed 30th October.

Thomas Howard, of the King and Queen Iron Works, Rotherhithe, Surrey, iron manufacturer, for improvements in rolling

iron bars for suspension bridges, and other purposes.—Sealed 5th November.

James Hardcastle, of Firwood, Bolton-le-Moors, county of Lancaster, for certain improvements in the method of scouring, bleaching, preparing, dyeing, and finishing piece-goods or woven fabrics.—Sealed 6th November.

Edward Wilkins, of No. 26, Surrey-place, Old Kent-road, London, tanner and currier, for an improvement or improvements in the manufacture of leather.—Sealed 6th November.

John Davies, of Manchester, patent agent, for certain improvements in the method of dyeing or staining woven or piece-goods or fabrics, and in the machinery or apparatus to be used for such or similar operations,—being a communication from abroad.—Sealed 10th November.

Robert Griffiths, of Havre, France; George Hinton Bovill, of Millwall, London; and George Rennett, of Bristol, engineers, for improvements in the construction of parts of apparatus used for propelling carriages and vessels by the atmosphere; and improvements in propelling carriages and vessels by atmospheric pressure.—Sealed 11th November.

Angier March Pirkins, formerly of Harper-street, but now of Francis street, Regent-square, London, civil engineer, for the extension, for five years, from 2nd November, 1846, of a patent granted to him by King William the Fourth, bearing date 2nd November, 1832, for certain improvments in the apparatus or method of heating the air in buildings, heating and evaporating fluids, and heating metals.—Sealed 11th November.

William Longmaid, of Plymouth, for certain improvements in the manufacture of chlorine, in treating sulphurous ores and other minerals, and in obtaining various products therefrom.—Sealed 12th November.

Alfred Watney, of Wandsworth, London, for improvements in the manufacture of horse-shoes, and applying shoes to horses and other animals.—Sealed 12th November.

John Lord, of Friday Bridge, Birmingham, merchant, for improvements in supplying steam-boilers with water,—being a foreign communication.—Sealed 17th November.

Richard Prosser, of Birmingham, civil engineer, for improvements in the manufacture of metal tubes, and in the machinery or apparatus for producing the same; and in apparatus for

fastening tubes in their intended places in steam-boilers and other vessels.—Sealed 18th November.

Robert James Hendrie, Jun., of Blossom-street, London, dyer, for an improvement in the preparation of silk.—Sealed 18th November.

Moses Poole, of Serle-street, London, Gent., for certain improvements to hinder the oxydation of iron in all its various states, of cast metal, steel, malleable iron; and also to render malleable iron more hard and durable,—being a foreign communication. —Sealed 19th November.

Thomas Bell, of the Don Alkali Works, South Shields, for improvements in certain processes in the manufacture of alkali, which improvements are applicable to the purposes of condensation.—Sealed 19th November.

Charles Hancock, of Grosvenor-place, London, artist, for certain improvements in cork and other stoppers, and a new composition or substance, which may be used as a substitute for, and in preference to, cork; and a method or methods of manufacturing the said new composition or substance into bungs, stoppers, and other useful articles.—Sealed 20th November.

Charles Smith, of No. 13, Newcastle-street, Strand, London, for new and improved methods in the construction and application of a variety of cooking, culinary, and domestic articles and utensils; some of which are applicable to cleaning, and a variety of similar useful purposes.—Sealed 20th November.

New Patents
SEALED IN ENGLAND.
1845.

To Benjamin Nickels, of York-street, Lambeth, machinist, for improvements in piano-fortes. Sealed 27th October—6 months for inrolment.

Reginald Orton, of Villiers-street, Sunderland, surgeon, for improvements in life-boats, life-buoys, and apparatus for conveying persons ashore from wrecked or stranded vessels.—Sealed 27th October—6 months for inrolment.

Samuel Childs, of Earl's-court-road, Kensington, wax-chandler,

for improvements in the manufacture of candles. Sealed 27th October—6 months for inrolment.

Denis Jonquet, of Chateaudun, France, for improvements in machinery for preparing skins for tanning and dressing. Sealed 31st October—6 months for inrolment.

Robert William Brandling, of Low Gosforth, Northumberland, Esq., for improvements in railways and railway carriages, for the security and convenience of the public.—Sealed 31st October—6 months for inrolment.

Charles Henry Collins, of Lambeth, engineer, for improvements on atmospheric railways. Sealed 31st October—6 months for inrolment.

Henry Clark, of Red-cross-street, Cripplegate, London, oil-merchant, for certain improvements in the preparation of materials to be employed for producing illumination. Sealed 31st October—6 months for inrolment.

James Hardcastle, of Firwood, Bolton-le-Moors, Esq., for certain improvements in the methods of scouring, bleaching, preparing, dyeing, and finishing piece goods, or woven fabrics. Sealed 31st October—6 months for inrolment.

Thomas Forsyth, of Salford, Lancashire, engineer, for certain improvements in signals, or in the method of giving signals, which are applicable to the working of railways, and which are also applicable to maritime purposes; and for certain other improvements in the working of railways. Sealed 31st October—6 months for inrolment.

Dalrymple Crawford, of Birmingham, Gent., for certain improved means of, or machinery for, arresting the progress of railway carriages and trains. Sealed 31st October—6 months for inrolment.

Henry Waller, of Vauxhall-road, engineer, for improvements in sluice-cocks. Sealed 31st October—6 months for inrolment.

Richard Archibald Brooman, of Fleet-street, London, Gent., for improvements in printing and figuring silk, cotton, and other textile fabrics,—being a communication. Sealed 3rd November—6 months for inrolment.

Richard Archibald Brooman, of Fleet-street, London, Gent., for certain improvements in gas-meters,—being a communication. Sealed 3rd November—6 months for inrolment.

Richard Biddle, of Leadenhall-street, surgical mechanician, for certain improvements in driving mills, and other machines or

machinery, by the power of the wind. Sealed 3rd November—6 months for inrolment

Christopher Binks, of Friars Goose, Durham, chemist, for certain improvements in manufacturing certain compounds of nitrogen, particularly cyanogen, ammonia, and their compounds, and the use or application in these manufactures of a substance or substances not hitherto so employed. Sealed 3rd November—6 months for inrolment.

Chandos Hoskyns, of Dublin, Gent., for certain improvements in trusses. Sealed 3rd November—6 months for inrolment.

Thomas Edwards, of Islington Foundry, Birmingham, engineer, for certain improvements in steam-engines. Sealed 3rd November—6 months for inrolment.

Paul Ackerman, doctor of medicine, of Skinner's-place, Size-lane, for certain improvements in harpoons and other similar instruments. Sealed 3rd November—6 months for inrolment.

George Ewart, of the New-road, zinc manufacturer, for improvements in the manufacture of chimney pots.—Sealed 3rd November—6 months for inrolment.

Thomas Bell, of Don Alkali Works, South Shields, Durham, for improvements in certain processes in the manufacture of alkali; which improvements are applicable to the purposes of condensation. Sealed 3rd November—6 months for inrolment.

Alfred Watney, of Wandsworth, Gent., for improvements in the manufacture of horse-shoes, and in applying shoes to horses and other animals. Sealed 3rd November—6 months for inrolment.

George Minter, of Gerrard-street, Soho, patent chair mannfacturer, and Jonathan Badger, of Walworth, carpenter and builder, for improvements in the construction of easy chairs. Sealed 4th November—6 months for inrolment.

Edward Augustin King, of Warwick-street, Middlesex, Gent., for improvements in obtaining light by electricity,—being a communication. Sealed 4th November—6 months for inrolment.

Richard Atha, of Walton, near Wakefield, engineer, for improvements in atmospheric engines. Sealed 4th November—6 months for inrolment.

Charles Sanderson, of West-street, Sheffield, manufacturer, for improvements in combining steel and iron into bars for tyres

for wheels, and for other purposes. Sealed 4th November—6 months for inrolment.

Samuel Carson, of Norwood, Gent., for improvements in treating eggs, for the purposes of food. Sealed 4th November—6 months for inrolment.

Henry Blumberg, of Camberwell Grove, distiller, for improvements in the purification of spirits for the use of brewing,—distillers, and rectifiers. Sealed 4th November—6 months for inrolment.

George Scolefield, of Manchester, agent, for certain improvements in machinery or apparatus to be employed for lithographic printing. Sealed 4th November—6 months for inrolment.

William Thomas, of Cheapside, merchant, for improvements in apparatus for impregnating liquids with gases,—being partly a communication. Sealed 4th November—6 months for inrolment.

Laura Laughton, late of Plymouth-grove, Manchester, but now of Everton, Nottingham, the Wife of Edmund Laughton, of the same place, Gent., for improvements in the manufacture of soap. Sealed 6th November—6 months for inrolment.

Uriah Clark, of Leicester, dyer, for certain improvements in the manufacturing and making looped fabrics. Sealed 6th November—6 months for inrolment.

John Soloman Bickford, George Smith, and Thomas Davey, all of Tuckingmill, Camborne, Cornwall, patent safety fuze mamanufacturers, for certain improvements in manufacturing the miner's safety fuze. Sealed 6th November—6 months for inrolment.

John Campbell, of Bowfield, Scotland, bleacher, for certain improvements in the apparatus or machinery for drying and finishing of bleached cotton and other goods. Sealed 6th November—6 months for inrolment.

Robert Burton Cooper, of Swinton-street, Gray's-inn-road, Gent., for improvements in the manufacture of taps or cocks, and in stopping bottles and other vessels. Sealed 6th November—6 months for inrolment.

Peter Armand Le Comte de Fontainemoreau, of Skinner's-place, Size-lane, for certain improvements in producing artificial fuel, —being a communication. Sealed 11th November—6 months for inrolment.

Bryan Donkin, of the Paragon, New Kent-road, civil engineer, for improvements on wheels as applicable to railway carriages, and on the mechanical contrivances by which railway carriages are made to cross from one line of rails on to another line, or on to what are generally called sidings. Sealed 11th November —6 months for inrolment.

William Henson, of Skinner-street, St. John-street-road, civil engineer, for improvements in machinery for weaving. Sealed 11th November—6 months for inrolment.

Christopher Vaux, of Frederick-street, Gray's-inn-road, Gent., for improvements in machinery or apparatus for tilling land. Sealed 11th November—6 months for inrolment.

Charles Frederick Bielefield, of Wellington-street, Strand, papier-maché manufacturer, for improvements in the manufacture of embossed or pressed paper, calico, leather, and other fabrics and articles. Sealed 11th November—6 months for inrolment.

George Hill Dutton, of Dutton-street, in the county of Middlesex, brewer, for certain improvements in conveying intelligence from one part of a railway train to another. Sealed 11th November—6 months for inrolment.

Samuel Thomas Cromwell, of Romsey, Hants, teacher of music, for improvements in apparatus to be applied to piano-fortes. Sealed 11th November—6 months for inrolment.

Robert James Hendrie, Jun., of Blossom-street, Norton Falgate, dyer, for an improvement in the preparation of silk. Sealed 11th November—6 months for inrolment.

Jacob Brett, of Hanover-square, Middlesex, Esq., for improvements in printing communications made by electric telegraphs; being a communication. Sealed 13th November—6 months for inrolment.

Joseph Ramon Yglesias, of Mark-lane, London, merchant, for a new mode of application and combination of mechanical arrangements (or of mechanical and hydrostatical arrangements), already known and in use, for the purpose, by such application and combination, of augmenting the power or moving force of first moving machines or engines.—being a communication. Sealed 13th November—6 months for inrolment.

Thomas Palmer, of Tavistock, in the county of Devon, currier, for certain improvements in mine lifting machinery; which

are also applicable to other purposes. Sealed 15th November—6 months for inrolment.

John Ayre, of Tynemouth, in the county of Northumberland, sail-maker, for an improved fabric for sail-cloth. Sealed 15th November—6 months for inrolment.

Edward Hall, of Dartford, Kent, civil engineer, for an improved double cylinder condensing engine. Sealed 15th November—6 months for inrolment.

Stephen R. Parkhurst, of Liverpool, machinist, for a method of propelling vessels. Sealed 17th November—6 months for inrolment.

James Boydell, Jun., of the Oak Farm Works, Dudley, iron-master, for improvements in the manufacture of hinges, and of handles for knives and other instruments. Sealed 17th November—6 months for inrolment.

James Boydell, Jun., of the Oak Farm Works, Dudley, iron-master, for improvements in the building of ships and other vessels. Sealed 17th November—6 months for inrolment.

William Newton, of the Office for Patents, 66, Chancery-lane, civil engineer, for improvements in manufacturing types, and other similar raised surfaces, for printing,—being a communication. Sealed 17th November—6 months for inrolment.

Frederick Oldfield Ward, of Cork-street, Middlesex, Gent., and Malcolm William Hilles, of Henrietta-street, Covent Garden, Gent., for improvements in the construction of railways, and in machinery and apparatus for working carriages thereon. Sealed 18th November—6 months for inrolment.

Richard Wright of Hermitage-terrace, sugar-refiner, for improvements in refining sugar. Sealed 18th November—6 months for inrolment.

Christopher Vaux, of Brighton, Gent., for improvements in apparatus or machinery for preventing accidents to carriages and passengers on railways; parts of which improvements are applicable to save lives and property in other places,—being a communication. Sealed 18th November—6 months for inrolment.

Henry Dircks, of Nicholas-lane, London, engineer, for improvements in the means of obtaining and preparing extracts from certain vegetable matters, and in the apparatus connected

therewith; which apparatus may be also applied to other similar purposes. Sealed 18th November—6 months for inrolment.

Edward Brown Wilson, of Leeds, engineer, for improved apparatus applicable to swivel bridges and turn-tables,—being a communication. Sealed 18th November—6 months for inrolment.

John Finlay, of Glasgow, ironmonger, for a certain improvement or certain improvements in raising and lowering gas and other lamps, lustres, and chandeliers. Sealed 18th November—6 months for inrolment.

Henry Buckworth Powell, of Pennington House, Southampton, Lieutenant and Captain in the Grenadier Guards, for certain improvements in carriages to be used on rail and other roads. Sealed 18th November—6 months for inrolment,

William Malins, of Mansion-House-place, London, and West Bromwich, Staffordshire, iron-master, for improvements in constructing roofs, and other parts of buildings, of iron or other metals, and in the preparation of the materials of which the same are or may be constructed. Sealed 18th November—6 months for inrolment.

Moses Poole, of the Bill Office, London, Gent., for improvements in raising and transporting earth and other heavy bodies,—being a communication. Sealed 18th November—6 months for inrolment.

James Laming, of Mark-lane, London, merchant, for improvements in making the cyanides and ferrocyanides of potassium and sodium,—being a communication. Sealed 18th November—6 months for inrolment.

Thomas Hunnybun and Edward Varden, of Cambridge, coachmakers, for improvements in that description of passenger carriages called omnibuses. Sealed 20th November—6 months for inrolment.

Frederick Gye, of South Lambeth, Surrey, Gent., for improvements in moulding sugar,—being a communication. Sealed 20th November—6 months for inrolment.

Thomas Samuel Parlour, of Holloway, in the county of Middlesex, Gent., for improvements in propelling vessels. Sealed 20th November—6 months for inrolment.

Nathaniel Chappell, of Arcadian Villa, Cumberland-road, Gent., for improvements in the manufacture of worts. Sealed 20th November—6 months for inrolment.

John Depledge, of the Thorncliffe Iron Works, near Sheffield, draughtsman, for a certain improved metallic broacher. Sealed 20th November—6 months for inrolment.

William Johnson, of Farnworth, near Bolton, Lancashire, agent, for certain improvements in machinery or apparatus for preparing cotton and other fibrous substances for spinning. Sealed 20th November—6 months for inrolment.

William Corscaden Thompson, of Liverpool, master mariner, for certain improvements in machinery or apparatus for propelling vessels on water. Sealed 20th November—6 months for inrolment.

James Donaldson, of Haslinden, in the county of Lancaster, woollen printer, for certain improvements in the processes of scouring, bleaching, and washing wool, cotton, silk, and other fibrous substances, both in a raw or manufactured state. Sealed 20th November—6 months for inrolment.

Ernest Edge, of Manchester, mechanic, for certain improvements applicable to the wheels and axles of engines, tenders, carriages, and waggons, to be used upon railways. Sealed 20th November—6 months for inrolment.

George Skinner, of Stockton-upon-Tees, in the county of Durham, merchant, and John Whalley, of South Stockton-upon-Tees, earthenware manufacturer, for certain improvements in the manufacture of earthenware pastes, and vitreous bodies; and also a new composition and material for the same, with certain new modes of combination thereof; which improvements, compositions, and combinations, are applicable to the manufacture of earthenware pastes, vitreous bodies, slabs, tiles, and pavement, and various other useful and ornamental purposes. Sealed 20th November—6 months for inrolment.

Eugene François Vidocq, of Gallerie Bivienne, France, for improvements in combining materials to be employed in the manufacture of tea-trays, boxes, trunks, table-covers, oil-cloths, and other articles, to be used in place of the materials now employed in such manufactures. Sealed 20th November—6 months for inrolment.

CELESTIAL PHENOMENA FOR DECEMBER, 1845.

D	H.	M.	
1			Clock after the sun, 10m. 42s.
	—		☽ rises 9h. 31m. M.
	—		☽ passes mer. 1h. 54m. A.
	—		☽ sets 6h. 20m. A.
	9	22	Vesta in oppo. to the ⊙ intens. of light 0·619
2	10	42	♀ in conj. with the ☽ diff. of dec. 7. 43. S.
3	15	38	♄ in conj. with the ☽ diff. of dec. 6. 36. S.
4			Occul. c^1 Capri. im. 3h. 12m. em. 4h. 19m.
5			Clock after the sun 9m. 6s.
	—		☽ rises 11h. 52m. M.
	—		☽ passes mer. 5h. 36m. A.
	—		☽ sets 11h. 31m. A.
	9	1	♃'s second sat. will em.
6	2	52	☽ in □ or first quarter
6	6	40	♂ in conj. with the ☽ diff. of dec. 5. 21. S.
	10	43	♃'s first sat. will em.
	—		Occul. λ Piscium, im. 10h. 27m. em, 11h. 13m.
7	9	54	♅ in conj. with the ☽ diff. of dec. 4. 18. S.
8	5	12	♃'s first sat. will em.
9	6	44	♃ in conj. with the ☽ diff. of dec. 2. 46. S.
	20	10	☿ greatest elong. 20. 36. E.
10			Clock after the sun, 6m. 54s.
	—		☽ rises 2h. 1m. A.
	—		☽ passes mer. 9h. 38m. A.
	—		☽ sets 4h. 18m. M.
11			Vesta in Aphelion
12			♀ in conj. with Pallas, diff. of dec. 17. 52. N.
	11	37	♃'s second sat. will em.
13	6	43	Ecliptic oppo. or ○ full moon
	12	39	♃'s first sat. will em.
15			Mercury R. A. 18h. 56m. dec. 23. 56. S.
	—		Venus R. A. 20h. 54m. dec. 19. 38. S.
	—		Mars R. A. 23h. 45m. dec. 2. 0. S.
	—		Vesta R. A. 4h. 21m. dec 15. 38. N.
	—		Juno R. A. 14h. 17m. dec. 7. 46. S.
	—		Pallas R. A. 20h. 45m. dec. 2. 51. S.
	—		Ceres R. A. 22h. 29m. dec. 20. 7. S.
	—		Jupiter R. A. 1h. 57m. dec. 10. 37. N.
	—		Saturn R. A. 21h. 11m. dec. 17. 20. S.

D.	H.	M.	
15	—		Georg. R. A. 0h. 24m. dec. 1. 52. N.
	—		Mercury passes mer. 1h. 20m.
	—		Venus passes mer. 3h. 18m.
	—		Mars passes mer. 6h. 9m.
	—		Jupiter passes mer. 8h. 20m.
	—		Saturn passes mer. 3h. 35m.
	—		Georg. passes mer. 6h. 47m.
	—		Clock after the sun, 4m. 33s.
	—		☽ rises 5h. 52m. A.
	—		☽ passes mer. 0h. 55m. M.
	—		☽ sets 8h. 49m. M.
	7	8	♃'s first sat. will em.
	14	32	♅ stationary
16	11		☽ in Apogee
17	18	15	☿ stationary
			Occul. $a1$ Cancri, im. 8h. 6m. em. 8h. 47m.
			Occul. k Cancri, im. 15h. 24m. em. 16h. 27m.
19			Ceres greatest hel. lat. S.
	4	52	♃'s third sat. will im.
	6	56	♃'s third sat. will em.
	7	19	☿ in the ascending node
	12	33	♀ in conj. with ♄ diff. of dec. 0. 49. S.
20	16		♀ greatest elong. 47. 16. E.
	—		Clock after the sun, 2m. 5s.
	—		☽ rises 11h. 8m. A.
	—		☽ passes mer. 4h. 38m. M.
	—		☽ sets 11h. 2m. M.
21	4	6	♂ in □ with the ⊙
	10	26	⊙ enters Capricornus,—Winter commences
	11	27	☽ in □ or last quarter
22	9	4	♃'s first sat. will em.
	—		Occul. g Virginis, im. 19h. 45m. em. 21h. 1m.
23	20	5	☿ in Perihelion
24			Occul. A. S. C. 1682, im. 18h. 5m.
25			Occul. λ Libra, im. 18h. 53m. em. 19h. 46m.
26	6	30	♃ stationary
	8	54	♃'s third sat. will im.
	10	58	♃'s third sat. will em.
27	5	6	☿ in inf. conj. with the ⊙
	17	23	♅ in □ with the ⊙
28	6	41	☿ in conj. with the ☽ diff. of dec. 1. 10. S.
	10	53	Ecliptic conj. or ● new moon
29	3		☽ in Perigee
29	10	59	♃'s first sat. will em.
30	6	7	♃'s second sat. will em.
31	4	29	♄ in conj. with the ☽ diff. of dec. 6. 28. S.
	5	29	♃'s first sat. will em.

J. LEWTHWAITE, Rotherhithe.

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CONJOINED SERIES.

No. CLXIX.

RECENT PATENTS.

To Richard Haworth, *of Bury, in the county of Lancaster, engineer, for certain improvements in steam-engines.*—[Sealed 10th February, 1845.]

These improvements in steam-engines consist in a certain novel and peculiar construction and arrangement of the elementary working parts, together with their mode of operation, whereby a considerable economy of fuel is said to be effected, and an increase of both power and speed obtained. The principal feature of novelty in the invention is as follows: The entire working engine has both the common reciprocating rectilinear motion, and also a circular motion round the centre of the driving-shaft; the steam cylinder being fixed at one end of a lever, whilst the crank revolves loosely in a step or bearing, at the other end of the same lever. The boss or centre of this lever is keyed fast upon the main driving-shaft, and is intended to communicate the motion of the engine to the same. This motion is transmitted in the following manner:—Upon one end of the crank-shaft a spur-wheel is keyed fast; the radius of its pitch line being equal to half the distance of the centres of the crank-shaft from

the main driving-shaft of the steam-engine. This wheel gears into another of the same diameter, which is fixed, and remains perfectly stationary; the main driving-shaft revolving loosely through its centre: consequently, the wheel upon the crank-shaft has a double motion to perform,—one being a rotary movement round its own axis, communicated from the piston by means of the connecting-rod, as in ordinary steam-engines,—the other being a planetary motion round the main driving-shaft, occasioned by the spur-wheel upon the crank-shaft revolving, while the other wheel (through the centre of which the main driving-shaft passes) remains perfectly stationary. The wheels being both of the same diameter, the "planet-wheel" will complete its orbit round the main driving-shaft and "sun-wheel" in exactly the same space of time as the crank takes to make one revolution round its own centre. The object of these improvements is to gain both power and speed, which is accomplished by the motion being communicated to the driving-shaft by a much longer leverage than usual; the increase of power being in proportion to the difference between the length of the crank and the length of the lever, in the end of which it revolves: the speed is gained by the shortness of the crank, as the piston has a smaller distance to travel at every stroke of the engine.

In Plate XVI., fig. 1, is a plan or horizontal view of the improved steam-engine (which the patentee terms a "planetary engine"), to be worked by high-pressure steam; fig. 2, is a front elevation of the same; and fig. 3, is a partial section, shewing more clearly the contrivance for the entrance and exit of the steam to and from the cylinder. *a, a,* are the foundation walls (or iron framing may be substituted) which support, in bearings, the main shaft *b, b**;—*c,* is the fly-wheel; *d,* the steam-cylinder; *e,* the connecting-rod; *f,* the crank; and *g,* the crank-shaft. This crank-shaft *g,* instead of revolving in fixed bearings, as in ordinary steam-engines, revolves in bearings at one end of the levers *h, h**; the centre or boss of the lever *h,* is keyed fast upon the main-shaft *b*; the steam-cylinder *d,* being attached, by bolts and lugs, to the other end of the levers *h, h**. The steam is admitted into the cylinder, for the purpose of actuating the piston, in

the following manner:—It will be seen, by referring to the sectional view, fig. 3, that the end *b**, of the shaft is made hollow, having a midfeather *i*, through the centre, to divide the entrance-pipe *k*, from the exit-pipe *l*, and revolves in a hollow steam-chest or chamber *m*, being packed steam-tight by means of stuffing-boxes. Steam is introduced into this chamber by the feed-pipe *n*, and passes through the opening *o*, into the entrance-pipe *k*, and thence through the slide-valve (which is of the ordinary construction) to the steam-cylinder. The action of the piston communicates rotary motion by means of the connecting-rod *e*, and the crank *f*, to the crank-shaft *g*; upon one end of this crank-shaft *g*, the planet-wheel *p*, is keyed, gearing into a sun-wheel *q*, of the same diameter; this wheel *q*, has no motion whatever, but merely serves as a rack, around which the planet-wheel *p*, travels. Through the boss of the wheel *q*, the end *b*, of the main driving-shaft passes, revolving loosely. Thus it will be evident, that, in consequence of the wheel *q*, remaining perfectly stationary, the rotation of the crank-shaft *g*, will cause the planet-wheel *p*, to travel round the sun-wheel or circular rack *q*, in the same space of time in which it revolves upon its own axis; thus causing the engine to revolve, while going through its reciprocating action; the main-shaft *b*, *b**, being the fulcrum, and revolving with it, in consequence of the bosses of the levers *h*, *h**, being keyed fast upon that shaft. In this improved arrangement of the steam-engine, in order to work the slide-valve, the excentric *r*, is stationary, and is connected to the valve by a series of links and levers *s*, *s*, *s*; the rotation of the engine communicating the requisite motion to the valve, the same as the revolution of the excentric *r*, would do if the engine were fixed or stationary. Fig. 4, represents a face view and section of a cam or tappet, to be used in connection with this arrangement, in place of the excentric, if it is desired to work the engine expansively; this cam being calculated to cut off the steam at half stroke.

The patentee remarks, that he has represented his invention as applied to a high-pressure "stationary" steam-engine; but he considers the improved "planetary engine" equally adapted to condensing engines, and whether employed for

marine or other purposes. He therefore claims the peculiar and novel construction and arrangement of the engine, and its particular mode of working, without confining himself to the precise dimensions or modification of the same, as above described and exhibited in the drawing.—[*Inrolled in the Petty Bag Office, August,* 1845.]

Specification drawn by Messrs. Newton and Son.

To James Murdoch, *of Staple-inn, in the county of Middlesex, mechanical draughtsman, for certain improvements in the manufacture of gas, and in the apparatus employed therein,—being a communication.*—[Sealed 20th February, 1845.]

This invention consists in certain improvements in the manufacture of gas (carburetted hydrogen) for illumination, which are carried into effect by means of the apparatus represented in Plate XVI., fig. 1, being a transverse section, and fig. 2, a longitudinal section thereof. *a*, is an ordinary retort, in which the coal to be distilled is placed. The neck a^1, of the retort is connected by a horizontal tube with a vertical retort *b*, at the back of the apparatus; and this retort *b*, is connected by another horizontal tube *c*, parallel to the first, with the neck *d*, from whence a pipe *e*, extends to the cooling apparatus *f*: the two horizontal tubes are termed purifying retorts; and each contains a spiral piece of iron. The retort *b*, is nearly filled with coke or charcoal, and is used for decomposing water, supplied through the syphon-pipe *g*, which descends nearly to the bottom of the retort, as indicated by the dotted lines in fig. 2. The lid of the cooling apparatus *f*, has, on its under side, a long spiral channel, interrupted by stops, so as to cause the gas, admitted into the apparatus by the pipe *e*, to pass over a large surface of water, and occasionally through it, previous to its escape through the pipe *h*, to the gasometer. *i*, is a syphon-pipe, for carrying off the surplus water of the cooling apparatus. *l*, *l*, are fire-bricks to protect the retort *a*, from the direct action of the flame; and *m*, *m*, are openings, conducting the

flames to each side of the retorts, and heating them by reflection from the roof *n*, of the furnace, composed of fire-brick. *j*, is a vessel containing water, to protect the fire-bars *k*, from the destructive action of the fire, and by the steam arising therefrom to increase the combustion of the fuel.

The mode of working with this apparatus is as follows:— The covers of the purifying retorts are first secured and carefully luted; the retort *b*, is nearly filled with coke or charcoal, and its cover secured and luted; a fire is then lighted in the furnace, to bring the retort *a*, and purifying retorts to a cherry-red heat, and the water retort *b*, to a bright red heat; and when this heat is attained, the retort *a*, is charged with coal, and water is admitted, in small quantities, into the retort *b*.

The action of the heat upon the coal disengages gas mixed with tar, which passes into the first purifying retort, and the sulphuretted hydrogen contained therein is decomposed by the coil of incandescent iron; at the same time the tar undergoing a second distillation is converted into gas, and mixes with that coming direct from the coal. The gas, which is now more dense from its combination with the carbon contained in the tar, proceeds along the purifying retort, until it arrives at the retort *b*, where it mixes with the hydrogen resulting from the decompositon of the water by the incandescent coke or charcoal, and passes into the second purifying retort *c*, carrying with it the carburetted vapours and volatile oils which may have escaped decomposition, but which, in their course along the retort *c*, become decomposed by the heated coil of iron, and give out their carbon to the hydrogen. By this means the hydrogen becomes carburetted without impoverishing the other gas. The gas then proceeds through the pipe *e*, to the cooling apparatus *f*, and thence through the pipe *h*, to the gasometer.

Instead of coal, resins, schistus, oils, fats, and similar substances, may be distilled in this apparatus; and, provided the purifying retorts, with the coils of iron, are retained, the gas may be distilled and purified at one operation, without the employment of a water retort.

The patentee claims, as his first improvement in the manu-

facture of gas,—causing the gas from coal, on leaving the distillatory retort, to enter a tube or tubes containing an iron spiral, maintained at a cherry-red heat, for the purpose of purifying the gas, and for decomposing and converting into gas the tar and essential oils which are mingled with the gas. Secondly,—in combination with the first improvement, the decomposition of water by means of incandescent coke or charcoal, for the purpose of obtaining hydrogen gas; the apparatus for this purpose being connected to the purifying retorts, and heated by the same furnace. Thirdly,—in combination with the first improvement, the employment of any suitable apparatus for converting resinous and essential oils into gas; such apparatus being connected to the purifying retort, and heated by the same furnace. Fourthly,—the general arrangement and combination of the parts of the apparatus above described. And, Lastly,—the application of purifying retorts containing a spiral of iron to all kinds of retorts for making gas from coal.—[*Inrolled in the Inrolment Office, August*, 1845.]

To James Heath Lewis, *of Dovor, in the county of Kent, printer, for his invention of certain improvements in printing.*—[Sealed 22nd May, 1845.]

The object of this invention is to obtain, by means of the ordinary constructions of platten printing-presses, impressions from steel, copper, zinc, or other engraved plates.

It is well known, that in very many small towns, copper-plate printing, or printing from engraved plates, cannot be performed from the want of suitable machinery to produce the impression, and therefore it is necessary to send such work to a distance, thus incurring expences and delays which the present improvements are intended to prevent.

The plates from which the patentee proposes to take impressions in letter-press printing machines are invoice heads, labels, address-cards, and such other plates as are employed by mercantile houses generally; but the superior kinds of printing, such as proving and obtaining impressions from

large plates, may be also performed in the letter-press printing machine, if required.

This invention refers to improvements in the construction of the tympan of the printing-press. As it is now made, the tympan consists of light frames, over which two skins of parchment are strained, and between them one or more thicknesses of woollen cloth are placed, in order to produce an elastic covering to the sheet of paper to be printed, and ease the blow of the platten in its descent on the face of the type. Instead of the lining of woollen cloth between the parchments or tympans, as they are technically called, the patentee introduces a sheet of caoutchouc or India-rubber, or gutta-percha, or any other gum possessing the requisite elasticity, cut to a thickness of about ⅛th of an inch; by which means an elastic cushion, capable of entering the lines of the plate, is obtained. In working off impressions by this improvement, it will be necessary to "block" the plates, that is, mount them on a block or metal frame, to make them type-high, similar to the plan adopted for stereotype plates. They are then inked and cleaned off in the ordinary manner, and placed beneath the platten, and the wet paper or card being laid over the engraving, the tympan is brought over it, and the platten depressed, as usual. A good clear impression will be thus obtained, and without disturbing the arrangement of the press for letter-press printing; for, by the application of the elastic cushion, less power will be required than is at present necessary for working off impressions from type and other raised surfaces.

Another plan of making the elastic cushion or tympan, which is considered to be particularly useful where the press is not kept in constant operation, is employing the India-rubber composition commonly known as "vulcanized" India-rubber, in place of the elastic gums before mentioned. The peculiar property of this composition being to retain its elasticity at all temperatures, a regularity in the color of the impressions will be insured, from the commencement to the end of the working.

The patentee claims, First,—the application to the tympan-frame of platten printing-presses of India-rubber, gutta-per-

cha, or other suitable elastic gum, for the purposes above mentioned. And, Secondly,—the application of "vulcanized" India-rubber to the tympan-frame of platten printing-presses, for the purposes above set forth.—[*Inrolled in the Petty Bag Office, November,* 1845.]

Specification drawn by Messrs. Newton and Son.

To William Newton, *of the Office for Patents,* 66, *Chancery-lane, in the county of Middlesex, civil engineer, for an invention of certain improvements in dyeing cotton, flaxen, and hempen yarns, and fabrics,—being a communication.*—[Sealed 3rd June, 1845.]

These improvements consist principally in the production of sulphuret of lead, which is effected, first, by means of one of the mordants of lead hereafter described (the novel application of which, to the purpose of dyeing, constitutes one improvement), and, secondly, by the employment of sulphuret of calcium.

Sulphuret of calcium is obtained by boiling quick lime with flowers of sulphur. The mordants in question are the double plumbate of potash and lime, the double plumbate of soda and lime, and the subacetate of lead. By the employment of any one of these mordants and sulphuret of calcium the following results are obtained:—1st, a slate grey color, composed solely of sulphuret of lead; 2nd, a fast black dye, having sulphuret of lead for its base; 3rd, a yellow, having for its base chromate of lead. This has been produced before in the art of dyeing; but the mordant employed for that purpose is less economical than those above mentioned.

The following is the mode of obtaining the mordants:—The subacetate of lead is formed by the combination of acetic acid with oxide of lead in excess; the double plumbate of potash and lime is formed by potassiate of lime and oxide of lead; and the double plumbate of soda and lime is formed of the sodate of lime and oxide of lead. All these products are obtained by the processes usually employed in chemistry.

Description of the process of dyeing:—The threads or fabrics of cotton, flax, or hemp, to be dyed, are first to be scoured. They are then steeped in a solution of one of the

above-mentioned mordants of lead; and, after being taken out, are allowed to drain; they are then washed with much water. In order to obtain a yellow dye, the threads or fabrics must now be passed through a solution of bichromate of potash, which produces a yellow of greater or less depth, according to the shade required to be obtained.

For a slate grey, composed solely of sulphuret of lead, the threads or fabrics, after being impregnated with the mordant, are to be dipped in a solution of sulphuret of calcium; the process is finished by softening the shade in the same manner as will be presently described for the black.

For black, the threads or fabrics, on coming from the mordant, are passed through the sulphuret of calcium; they are then washed, and converted into black by means of iron and logwood, as is generally done by the processes pursued in dyeing, which give the shade required in commerce. The dye is finally softened in the ordinary way.

The patentee claims, Firstly,—the application of sulphuret of lead to the purpose of dyeing cotton, flaxen, and hempen yarns and fabrics. Secondly,—the use of the double plumbates of potash and lime, and soda and lime, as mordants, in the process of dyeing; but he lays no claim to subacetate of lead. Thirdly,—the application of sulphuret of calcium, as above described, and the method of converting the mordants and the sulphuret of calcium into sulphuret of lead.—[*Inrolled in the Petty Bag Office, December,* 1845.]

Specification drawn by Messrs, Newton and Son.

To James Murdoch, *of Staple-inn, in the county of Middlesex, mechanical draughtsman, for a certain improvement or certain improvements in dyeing,—being a communication.*—[Sealed 10th June, 1845.]

This invention consists in the employment of certain materials as substitutes for cream of tartar, and for the compound of cream of tartar and alum, which are ordinarily used as mordants in dyeing.

The substitute for cream of tartar is composed of muriate

of soda or muriate of potash combined with nitric acid; and, instead of alum, sulphate of alumina is used. The mode of preparing the ingredients is as follows:—One hundred pounds of sea salt are mixed with three hundred pounds of water, and when the salt is dissolved, twenty pounds of nitric acid are introduced; and if the mordant is required to be analogous to the compound of cream of tartar and alum, one hundred pounds of sulphate of alumina are to be gradually added to the mixture: the water should be cold, and the mixture but slightly stirred, especially whilst the sulphate of alumina is being added, in order to avoid, as much as possible, the disengagement of nitric and muriatic acid gas, which would injure the quality of the mordant.

The new mordant may be used either in the dye-bath or in the mordant-bath, in the same manner as cream of tartar or cream of tartar and alum. The patentee states, that it will be advisable, as a measure of precaution, to begin the first piece with cream of tartar or cream of tartar and alum, according to the color of the dye-bath, especially for blacks, crimsons, and violets; he recommends, for these colors, the addition of one part cream of tartar to three parts of the new mordant, to prevent the colors from changing.

The patentee claims, Firstly,—the employment, as a mordant in dyeing, of a compound formed of nitric acid and muriate of soda or muriate of potash. Secondly,—the employment of a mordant composed as in the first claim, with the addition of sulphate of alumina.—[*Inrolled in the Inrolment Office, December,* 1845.]

To Charles Joseph Hullmandel, *of Great Marlborough-street, in the county of Middlesex, lithographer, for certain improvements in producing patterns upon earthenware and porcelain.*—[Sealed 22nd May, 1845.]

These improvements in producing patterns upon earthenware and porcelain consist in obtaining a floating surface of unmingled colors (which may be drawn into any desired shape, according to the ordinary process of preparing color for

marbling paper), capable of being taken up by glazed or unglazed ware, when immersed therein, and by this means producing marble patterns on such articles, and combinations of various kinds of marble patterns on the same articles.

The following is one method of preparing the marbling surface:—First dissolve gum tragacanth in water till the solution attains about the consistency of thick cream (this gum takes from three to four days to be thoroughly dissolved). To this solution add water enough for it to weigh about 1·002 sp. gr. when weighed with an hydrometer (distilled water being 1·000 sp. gr.), or one part of the above solution to about ten parts of water; and when thus thinned add a decoction of mucilaginous matter, obtained either by boiling some flea seed (pulicaria or flea-wort), or a decoction of common linseed, say one ounce in four quarts of water. Of this mucilaginous decoction put one part to five parts of the solution of gum tragacanth, above described, and mix the whole well together. Owing to the great weight of the colors used in this process it is desirable to add to every four quarts of the above mixture one part of slip (a mixture of pipe-clay in water), the addition of which enables the colors used for earthenware to float on the surface of the mixture, but otherwise they would be apt to sink to the bottom. The solution composed of the ingredients above mentioned may be termed the "bath." The kind of colors to be employed in this part of the improved process of marbling are those known in the potteries as underglaze colors, but, in addition to the usual grinding, they must be re-ground with water on a marble slab, or a thick piece of plate-glass with a muller, and kept in separate pots for use as wanted.

The trough for containing the mixture or bath is provided with a slanting board, attached to one side of the trough, and dipping into the liquid gum. The object of this board is to facilitate the cleaning of the surface of the bath, and for this purpose a wooden straight-edge is applied, so as to skim the color left after each operation on the surface of the bath, and draw it on to the sloping board. In each of the pots containing the colors to be used, a small open brush, made of hogs' bristles, is placed, and to each color a little

common ox-gall is added; putting more gall gradually to each color in the order in which it is to be used: the color last used will therefore contain the greatest quantity of gall.

As ox-gall, in the state in which it is ordinarily used, soon putrifies, the patentee prefers to have it prepared in the following manner:—Take one pint of gall and add to it one ounce of common salt; take another pint of gall and add to it one ounce of powdered alum. Boil each mixture separately for a quarter of an hour, then mix them together. A strong sediment will remain; when cold, strain through a cloth, and put it in a bottle for use.

The bath and colors being ready for use, the color, No. 1, is splashed with a brush on to the surface of the bath; then No. 2; and so on, according to the number of colors to be employed, in the same manner as is adopted for marbling paper for book-binders. When a good pattern, similar to the graining of marble, is produced on the surface of the bath, the porcelain or earthenware article to be ornamented is immediately dipped therein; by which means the color floating on the top of the bath will adhere to the surface of the article so immersed. In order to obtain a good marking of the marble pattern, the earthenware must be in the state of bisque, not fired too hard; for the more suction the ware has, the more beautiful and clear will be the pattern. As soon as the pattern is obtained on the ware, it may, if thought desirable, be dipped in to clear water, to remove the superfluous gum-water which adheres to the article. This dipping in clean water is preferred to be practised in all cases where the article has strong suction. If the article to be marbled partakes of a spherical form, like a jug or a bason, it must be rolled over the surface of the bath.

It is stated, that beautiful effects may be produced by marbling only a portion of the goods, leaving the rest blank, or ornamented by other colored marbling, or by transferred engraving, as used already in the potteries, or by paintings by hand, appropriate to the styles, thus combining the marbling with the various processes now in use. To obtain these effects, the parts to be protected from the marbling must be covered with a reserve, either of whitening mixed with a little

gum-water, or slip and gum and sugar, or any other material already in use as reserves. If two different sorts of marbling are wanted on the same article, the part not to be marbled with No. 1 marble, is covered with a reserve, and the part only which is uncovered receives the pattern. The article is then dipped in water to remove the reserve, and the ware is allowed to get quite dry; after which a reserve is placed over the part marbled with No. 1 marble, and the unprotected part is covered with No. 2 marble; the reserve is then washed off as before. By this means the ware is covered with two distinct sorts of marbles, and beautiful results, combining various colored marbles, can be thus obtained.

When the inner surface of a basin, or other similar article, is to be marbled, a small piece of leaden pipe is bent into the shape of a syphon, and one end introduced to the interior of the article, which must be let down into the bath bottom upwards. The upper end of the pipe is jagged or pierced with holes, to allow the confined air in the basin to enter the pipe and find its way out. In effecting the marbling of the inner surface of the basin, the operator holds the pipe in one hand and the basin in the other hand; he then gradually plunges the basin into the bath (the surface of which is marbled beforehand, as above described), and gently turns the basin at the same time from right to left, or from left to right: this circular motion is to enable the marbling to adhere to the inside of the basin in a manner more agreeable to the eye. The articles marbled are, when dry, to follow the usual course of manipulations applied to earthenwares, as glazing, firing, &c.

When the process of marbling is to be used upon glazed ware, the colors are ground with oil instead of water; in this case the colors used must be those employed for "over glaze." Previous to applying the marbling, the article to be ornamented is washed with a thin solution of resin, or of Canada balsam, or of any similar substance, in spirits of turpentine, or any similar solvent, to enable the oil colors to adhere to the glaze; on taking the ware out of the bath, it is better not to dip it in water till the colors are dry. Reserves of whitening, &c., as above explained, can be likewise employed

for giving a varied marble pattern to glazed ware, as well as articles in the bisque or porous state. This over glaze marbling can be used with great effect in conjunction with painting and batt printing, and thus producing novel and pleasing effects.

The patentee claims, Firstly,—the application of the marbling process, generally, for obtaining representations of real or fancy marbles upon earthenware and porcelain, both in their porous or bisque and glazed state. And, Secondly, —the mode, herein described, of obtaining on the same article a combination of variously colored marble patterns.—[*Inrolled in the Petty Bag Office, November,* 1845.]

Specification drawn by Messrs. Newton and Son.

To JAMES NAPIER, *of Hoxton, dyer, for improvements in treating mineral waters to obtain products thereof, and for separating metals from other matters.*—[Sealed 22nd October, 1844.]

THE first part of this invention relates to the treatment of mineral waters impregnated with copper and iron.

It has hitherto been the practice to precipitate the copper contained in mineral waters simply by the introduction of pieces of iron, and the water is afterwards allowed to run into large reservoirs, where the iron absorbs oxygen from the air, and a small quantity being thus precipitated, as an oxide, is collected, and sold as ochre; the water is then allowed to run off. This process is attended with many disadvantages, the chief of which is, the great destruction of iron, resulting from the existence of that metal originally in the water in the state of a persulphate, which salt has the property of dissolving almost all metals, so that by its reaction upon the iron used to precipitate the copper the loss is occasioned. The patentee's improvements on this process consist, firstly, in obtaining with certainty a much larger quantity, amounting to nearly the whole of the copper held in solution, and in a more pure state; secondly, in a more economical use of the iron employed to precipitate the copper; and thirdly, in the recovery, as a valuable product,

of the iron originally held in solution, as well as that used during the process of precipitating the copper.

The first improvement is effected by adding a small quantity of sulphuric acid to the waters, before introducing the iron; by this means, the oxide of iron formed by the galvanic action (arising from the deposition of the copper upon the iron) is dissolved, and thus a clean surface of iron will be always presented to the copper salt; so that the process is facilitated, the copper precipitate obtained nearly pure, and the iron, which in the ordinary process would be mixed with the precipitate, is dissolved, forming protosulphate of iron or copperas, to be afterwards obtained by evaporation.

The second improvement is effected by reducing the persulphate of iron in solution to the state of the protosulphate, before putting in the pieces of iron used for precipitating the copper; the iron in solution being thus reduced to the proto state, with the addition of a small quantity of sulphuric acid, the copper may be precipitated with the loss of little more than an equal weight of iron.

The third object, that is, the recovery of the iron as a valuable product, is obtained by evaporating the waters that have been treated as above, and crystallizing and obtaining from them sulphate of iron or copperas; after crystallization, the mother liquor may be treated in the ordinary way for obtaining ochre.

The method of carrying out these improvements is as follows:—The water to be operated upon being collected in a tank, sulphuric acid is added, in the proportion of about one pound thereof to fifty gallons of water, and the requisite quantity of old iron is put in; in the course of a few hours the water is completely exhausted of copper, and is then drawn off, with the precipitated copper, through a tap or plug-hole, into a filter of sponge, cloth, or other suitable material, which retains the copper; the protosulphate of iron in solution passes through the filter, and is afterwards evaporated and crystallized.

To reduce the persulphate of iron to a protosulphate, sawdust is thrown into the tank containing the water (in the

proportion of one pound thereof to fifty gallons of water), at the same time that the sulphuric acid and iron are added. The patentee does not confine himself to the use of sawdust, as other vegetable matters will have the same effect, as will also the soluble portion of the refuse lime from gas works.

The object of the second part of the invention is the application to metallic ores, when in a fused state, of a current of electricity, to separate therefrom the metals which they contain.

The patentee describes the following method of treating copper ores, to illustrate this part of his invention, which is applicable to ores of other metals that are capable of being held in fusion with fluxes:—A crucible or other vessel, made of an electro-conducting material (those used by the patentee have been made of plumbago), is prepared, by lining the inside all round with clay luting, except the bottom, which is left uncovered. The regulus or calcined ore (which, when sulphurets are used, should have been roasted, to drive off as much of the sulphur as possible) is introduced into the vessel with the usual fluxes, and the vessel being then placed in an ordinary air furnace, the heat is kept up until the mass is in a state of fusion. In the mean time, the patentee prepares a common voltaic battery of copper and amalgamated zinc, charged with acidulated water (one part sulphuric acid to twenty-five parts water); he attaches to the positive wire of the battery an iron rod, having an iron disc, a little smaller than the interior diameter of the crucible, rivetted at right angles to its extremity; and to the negative wire of the battery he attaches an iron rod only. The iron disc is placed on the surface of the fused mass in the crucible, and the rod is kept in contact with the outside of the crucible; the fused matter now forms part of the electric circuit, and, the heat being kept up, the metal is gradually reduced, and deposited at the bottom of the crucible.

The patentee says he has found that by merely connecting, by an external good electro-conductor, the iron on the surface of the fused mass with the bottom of the crucible, an electric circuit is formed, and metal is deposited; but the result is not so satisfactory as when the battery is employed.

He does not confine himself to the particular methods of operating above described; but he claims, as the First part of his invention, the addition of sulphuric acid to mineral waters containing copper and iron, previous to reduction; for changing the solution of iron in such waters from the per to the proto state, and obtaining the iron as a protosulphate or copperas; and with regard to the Second part of his invention, he claims the treatment of the ores of copper, and of other metals capable of being held in fusion with fluxes, by applying to these, when in the fused and fluxed state, a current of electricity, for the purpose of extracting such metals.—[*Inrolled in the Inrolment Office, April,* 1845.]

To JEREMIAH SIMPSON, *of Burslem, oven builder, and* JOSHUA SEDDON, *of Burslem, aforesaid, earthenware manufacturer, for an improved method of constructing the flues and interior arrangements of ovens and kilns used by manufacturers of china and earthenware.*— [Sealed 24th May, 1845.]

THIS invention consists in improved methods of constructing the flues and interior arrangements of ovens and kilns used for baking china and earthenware.

The flues (or bags, as they are commonly termed) for conducting the heat from the oven mouths, are formed in the oven wall, or close against it, and are carried to a certain height within the oven, at which point they terminate in several vents or orifices against the wall, so that the heat is diffused regularly throughout the interior of the oven. The flues are connected together, at their lower ends, by a circular flue, constructed above the floor of the oven, and are divided from each other, at regular distances, either by solid brickwork, or by a course of bricks, placed horizontally and at intervals over the circular flue, between the upright flues, so as to leave small openings or interstices between the bricks for the heat to escape through. In Plate XVIII., fig. 1, is a vertical section of one of the improved ovens or kilns. *a*, is the wall of the oven; *b, b*, the fire-places; *c*, open flue or tunnel under the floor *d*; *e*, circular flue above

the floor; *f, f,* upright flues; and, *g, g,* the open course of bricks between them. The recessed parts *h, h,* of the oven wall, above the vents of the flues *f, f,* shew how those flues are taken partly out of the wall.

Fig. 2, is a modification of fig. 1, differing from it only in these respects, that the walls are recessed all round to admit of the flues and the brickwork between them; and that besides the main flues *f, f,* which are built perpendicularly over the oven mouths, there are intermediate flues *i, i,* between the main flues;—the section of the flue *e,* beneath the floor of the oven, is taken, in this figure, right across its centre, and does not shew the circular cavity, as in fig. 1.

The patentees claim the several methods of constructing the flues and interior arrangements of ovens and kilns used by manufacturers of china and earthenware by means of flues or bags, formed immediately within and against the oven walls, and with main bags and intermediate bags issuing in vents or orifices close to the walls or sides of the ovens or kilns, according to the above description.—[*Inrolled in the Inrolment Office, November,* 1845.]

To JAMES FRANCIS PINEL, *of Skinner's-place, Size-lane, in the city of London, chemist, for certain improvements in the mode of treating farinaceous substances.*—[Sealed 1st May, 1845.]

THIS invention consists in the preparation of all kinds of flour (but especially the fecula of potatoes) by means of acids, in order to obtain a certain gum, which may be employed as a substitute for gum tragacanth, Senegal, and similar gums generally used for dressing, stiffening, glazing, sizing, dyeing, printing, and finishing calicoes, nets, crapes, laces, silks, papers, and all goods or fabrics of a similar kind.

The mode of manufacturing the gum is as follows:—Half a gallon of nitric acid and half a pint of hydrochloric acid are mixed with one hundred gallons of spring water, and then as much flour or fecula as will be sufficient to form a paste being added, the whole is well worked together, and

left for two hours to settle; after the expiration of this time the paste is carefully removed into buckets properly prepared for allowing the water to drain off. When sufficiently drained, the paste is divided into small lumps, which are placed on shelves in a drying room, and allowed to remain until perfectly dry; the dried paste is reduced to powder and placed on shelves in a stove, the temperature of which is raised, on the first day to 100° Fahr., on the second day to 150°, and on the third day to 190°. After this drying process the powder is allowed to cool, and is passed through a sieve; it is then placed in an oven, the heat of which is raised to from 300° to 350° Fahr., and when thoroughly baked, it will be ready for use;—the operator can ascertain if the process has been correctly carried out by mixing a small quantity of the powder with some filtered water, in which it should readily dissolve, without leaving any sediment.

To produce the above gum in lumps, resembling natural gum both in color and transparency, the patentee mixes the powder, after it has gone through the stove and been sifted with as much water as will reduce it to a paste, adding 1 part of nitric acid to 400 parts of water. When well mixed the paste is spread upon copper dishes, in layers three quarters of an inch deep, and placed in an oven heated to from 240° to 300° Fahr.; as soon as it has become sufficiently hard it is removed from the oven into the open air, and when cool is ready for use.

If the flour or fecula is grey, that is, if it has been badly prepared and adulterated or damaged, the patentee uses, instead of the hydrochloric acid, half a pint of sulphuric acid, by the agency of which the heterogeneous substances are separated from the good flour: the mode of operating is, in other respects, the same as before.

The patentee claims, Firstly, the combination of nitric and hydrochloric acids with flour, in the manner above described; and Secondly,—the mode of using the sulphuric acid for separating the heterogeneous substances held and contained in the flour and fecula.—[*Inrolled in the Inrolment Office, November,* 1845.]

To Anna Maria Stowell, *of Gloucester-place, Islington-green, in the county of Middlesex, straw bonnet manufacturer, and* Thomas Little, *of Hoxton Old Town, in the said county of Middlesex, willow square manufacturer, for improvements in the manufacture of ladies' bonnets or hats.*—[Sealed 20th March, 1845.]

This invention consists in weaving certain fabrics or tissues, and making ladies' bonnets or hats thereof. For the warp of the fabric or tissue, the patentees use willow, cordinet, silk cord, ribbon, strips of velvet, fabrics or threads of caoutchouc or its compounds, or any fabric of flax or cotton, or both. For the weft, the patentees employ velvet in strips or other forms, ribbons of any description, cordinet, willow or chip, straw of any description, and in any of its ordinary states of preparation; silk cords or braids, chenille, Manilla grass and all other grasses, gimp, glass threads, Berlin wool, threads of gold, silver, or other metals, or their compounds, or any kind of fancy trimmings, simple or compounded of different materials, as cotton, silk, horse-hair, camel-hair, whalebone, cane, or any vegetable and fibrous substance. The warp and weft may each consist of only one of the above materials, or of a combination of some of them; and the fabrics or tissues are made by the ordinary process of weaving.

The patentees claim, as their invention, the fabrication and manufacture of woven tissues or fabrics, composed of any of the substances, materials, and articles, either simple and singly, or compounded and commingled with either of the substances, materials, and articles, above described.—[*Inrolled in the Inrolment Office, September,* 1845.]

To Thomas Brown Jordan, *of Cottage-road, Pimlico, in the county of Middlesex, mathematical divider, for his invention of improvements in machinery and apparatus for cutting, carving, and engraving.*—[Sealed 17th February, 1845.]

The patentee, in commencing his specification, states that the machines for carving hitherto constructed have one feature

in common, viz., the use of revolving tools,—most of the machines admit of the tool being moved in various directions in a horizontal plane, and some of the machines admit of a motion being given to the work as well as to the tool. In most instances the path of the tool is governed by a templet, either fixed upon or under the work, and the cross section of the moulding or form produced is a counterpart of the section of the tool used.

The present invention has for its object the construction and arrangement of an improved machine for copying or reproducing almost any description of cut, carved, and engraved surface.

In Plate XVII., fig. 1, is a plan view; fig. 2, a front elevation; and fig. 3, a side elevation of the improved machinery. A, B, C, D, is a cast-iron frame, forming the bed of the machine; the upper portions of the sides A, B, and C, D, are planed smooth and parallel, and serve as a railway for the wheels E, F, G, H, to run on. These wheels are mounted between centres, which are fixed to the frame I, J, K, L, and are so adjusted as to ensure the steady motion of the frame in a horizontal plane, and in the direction of the lower rails. M, N, O, P, is the floating table or chuck of the machine, to which the work and patterns are attached, and it is furnished with wheels which roll on the upper edges of the frame I, J, K, L; the like precaution of nice adjustment being observed. It will readily be seen, that this arrangement gives the workman the power of moving the work about in every possible direction, in a horizontal plane. Other details in the construction of this part will be better understood after the whole has been generally described. 1, 2, 3, 4, are the supports for the vertical slide and other parts connected with the cutting and tracing apparatus; 5, 6, is the slide; and 7, 8, a bar, cast on the slide, which has a T-groove through its whole length, and to which the head-stocks, for the mandrils 9, 10, 11, are clamped, at any required distances asunder. Motion is given to these mandrils by the band 12, which is driven by any first mover at such a rate as to produce from 5000 to 7000 revolutions of the cutters per minute. Q, R, is the treadle, which is managed by the workman's foot, and serves to raise and

depress the cutters. Its connection with the horizontal bar, carrying the pulleys 13, and 14, is fully shewn in the drawings. The weights *s*, *s*, are a counterpoise to that of the slide and parts connected with it, which can be varied at pleasure, according to the number of mandrils in use. 15, is a stop-screw, which regulates the range of the slide to which it is fixed, so that it cannot turn in its bearings; it passes through a free hole in the bracket 16, which serves as the stop to the locking-nuts 17, and 18; and these may be fixed on any part of the screw, so as to determine the distance through which the slide shall move. In very large machines it is requisite to introduce some mechanical arrangement for giving the workman more command over the movements of the floating table, and, for this purpose, the plan shewn in the drawing has been adopted; but it is obvious, that several modifications of the rack and pinion, or the screw, may be used with nearly the same effect.

The arrangement shewn in the drawings consists of the steering-wheel U, and its axle, which passes across the centre of the lower rolling-frame, and is furnished with a drum, of three or four inches diameter, about which is coiled the centre portion of the wire line V, V, while its ends are fixed to screws W, W, which pass through sockets cast in the floating table, and turning the steering-wheel to the right or left, will give a corresponding motion to the work. Within the steering-wheel, and mounted on the same axis, is a small cogged wheel X, which serves to fix the axle, and, consequently, to stop the motion from right to left, whenever the detent Y, is dropped into its cogs. In some cases, as where the floating table and work are very heavy, it may be desirable to move the table by steam-power, as in the following manner:—Z, Z, is an endless band, passing over pulleys fixed to the bed of the machine, to which a slow motion is communicated from the first mover; at *a*, *a*, this band passes through the jaws of a clamp *b*, which is so arranged as to allow both sides of the band to pass freely when its handle is in a central position, and to clamp the frame to the right or left portion of the band, when in either of those positions. The result of this action is, that when the left portion is

clamped, motion is given to the work in that direction in which it is travelling, and the opposite direction is obtained by reversing the clamp; but the band itself always travels in the same direction.

Fig. 4, is a front elevation of a part of the machine, with the additions requisite for cutting on the round, and a side elevation of the head-stocks, turning-plate, &c. A, B, represent head-stocks, which are fixed to the floating table, for the purpose of supporting the work between centres, in order that it may be carved on every side; several pairs of these may be fixed on the table at one time, dependant on the number of pieces it is intended to cut. The mandril of A, is provided with a wheel *c*, having a screw cut in its edge, suited to the threads of the screw *d*, which, when in use, is placed across one end of the floating table, in the bearings *e*, *e*, and is adjusted to gear with the wheels of all the front head-stocks in use: the back head-stocks B, are fixed to the table, exactly opposite the front ones, and are used for supporting the other ends of the pieces of work and pattern. When the table is thus fitted with its head-stocks and work, supported between centres, any motion given to the wheel M, which is the head of the large screw, will move all the pieces of the work through a certain angle, and present another face of it to the cutters; and if this turning of the screw is continued from time to time, and the cutters made to operate upon the new portion presented at each turn, of course the whole circumference would eventually be carved. At D, there is a cogged wheel, fixed on the screw *d*, with a detent or click, for fixing the screw in any required position. For some descriptions of work, as spiral work, it is desirable to have the power of turning the guide-screw at a given rate, while the work is being cut; and this is readily accomplished by the wheels M, E, F, G, being thrown into gear. The axle of the wheels E, F, works in a socket cast in the floating table, and it may be removed at pleasure; but when in use, a wheel of any other number of cogs may take the place of F, and the wheel G, may be changed in like manner. This wheel G, is fixed to the same axle as the drum H, having its bearing in a socket, cast on the lower frame. Around this

drum is coiled the centre portions of a wire cord K, the ends of which are fixed to the bed of the machine, in the same way that the ends of the band V, are fixed to the floating table. N, N, fig. 4, are two elevations of a cast-iron plate, which is used between the centres for fixing brackets and other elaborate subjects which require a variety of motions, in order that the cutter and tracer may be able to reach all the parts; O, P, Q, is the end of the plate; *s*, is the centre, which works on the centre of the front head-stock, as shewn at S^1, in the side elevation; a similar centre is provided in the other end of the plate, to work on that of the back head-stock. B, is a pin or carrier, which fits into a hole in the face-plate of the front head-stock; T, U, is the chuck for the work or pattern; it is furnished with a spill, turning in a socket in the plate, and with cogs in its circumference, so that the detent V, may fix it in any required position. When the work and pattern is mounted in this way, the workman can move it to any angle about the axis S^1, W, and also to any angle about the axis X, Y, and, consequently, can bring the cutters perpendicular to any side, except that by which it is fixed to the chuck. Of course, a number of these turning-plates may be used at one time, as already explained in other cases; and when the chucks are moved, each must be moved through the same angle.

The patentee having described all the parts of the machine, proceeds to explain the mode of using it in its most simple form:—Suppose an original carving has been produced by hand, of which a number of copies are required, and that it is a subject carved in bold relief on one face only, it will, in that case, be expedient to get a metal cast of the original carving for a pattern, and fix this to the floating table of the machine under the tracer, as shewn at *d, e, f, g,* figs. 1, and 3. On each side of the pattern, pieces of wood or other material, of the proper size to carve it out of, are fixed, as at *h, i, j, k,* and the number of these which can be done at one time is only limited by the relative size of the work and the machine. Two only are shewn in the drawings, and these are represented further from the pattern than is required in practice, in order to make it more clear. Having fixed the

tracer in its socket, and adjusted the cutters *m*, *m*, so that they are over the centre lines of the blank pieces, when the tracer *n*, is over the centre line of the pattern, and having brought the points of the three to the same level, the machine is ready to be set in motion. When the cutters are at full speed, they must be brought into action by withdrawing the pressure of the foot from the treadle, and thus allowing the cutters to come down, which will immediately cut away some superfluous part of the material, and then, by gradually moving about the table with the hands, and keeping the tracer constantly floating over the contour of the pattern with the foot, a facsimile of the pattern is speedily produced on as many pieces as may have been put down for the purpose. In an elaborate piece of work, it is of course requisite to use a variety of cutters and tracers. It is also important that the cutters and tracer used together should be of the same size, and that the form of the cutting-edge should be such as to produce the figure of the tracer by revolution about its axis. The larger cutters are generally used first to rough out, and the smaller ones afterwards for cutting the minute parts of the design. Some of the leading forms of the cutters are shewn in figs. 6, 7, 8, 9, and 10; but these may be greatly varied to suit different styles of work, although a good selection of the forms shewn are sufficient for all ordinary purposes: the outlines of these figures shew the form of the tracer, and the dotted lines that of the corresponding cutters. It will be quite obvious to any person acquainted with machinery, that the fixing of the work and pattern between the centres, fig. 4, already described, would not make any difference in the manipulation for cutting it, as it is merely a different mode of chucking, by which the advantage is obtained of being able to cut on all sides of the work. This remark, however, only applies to cases in which a pattern is used: there are others which require further notice, as for instance, when it is required to produce spirals on the surface of a cylinder or cone, or when the machine is employed to plough grooves or hollows; in these and similar cases, a pattern is not generally necessary. Spirals of any pitch may be

obtained by throwing the change-wheels F, G, fig. 4, into gear and working the band K; the cross motion of the table, from right to left, being stopped, by dropping the detent Y, into the cogs of the wheel X. As many pieces of wood or other material as are intended to be cut at one time, are roughed out, as if for turning, and fixed between the centres on the table, so as to be parallel to each other, and to the bed-rails; and over the centre line of each piece a cutter, suitable for producing the required section of the groove, is adjusted on the bar, as before described. The change-wheels, shewn in the drawings, would produce a spiral of one turn in ten inches; and of course other numbers may be put on to obtain different pitches, as in the screw-cutting engines already well known. When the machine is used in this manner, it is better to drive the table backwards and forwards by turning the hand-wheel L, instead of moving it in the usual way; this, of course, causes each piece of work to revolve at a rate bearing a fixed proportion to the space through which it is driven in the direction of its length, and, consequently, the cutters will produce the spiral required. When several spiral lines, running parallel to each other, are required on the same piece, it is merely requisite to move the screw through a certain number of revolutions and parts, independently of the change-wheels, and then throw it in gear with them, and proceed as before. N, O, fig. 4, is a small wheel and detent, for doing this without moving the other wheels.

Fig. 5, shews another modification of the machine for carving patterns on the surface of a cylinder from a flat guide or drawing. *a, b, c, d*, is the cylinder of wood or other material prepared for receiving the pattern, and mounted between centres, which are fitted into sockets cast on the inside of the lower frame. There is a face-plate fixed on the end of the cylinder *a, b, c, d*, having a groove in its edge for carrying the wire band *e, f*, which is passed once round and fastened to it at one point. The ends of this band are carried in opposite directions, and fixed to the screw *g*, and bracket *h*; the screw being used to strain it, and at the same time to connect the floating table with the cylinder, which is secured

between the centres of the lower frame. The upper frame or floating table, as it has been before termed, has, in this case, one half of its top removed, so as to admit of the cutter acting on the work in every possible position of the frames; the other half is used to fix the drawing templet or other guide for the tracer on, as shewn at *i, j*. In this arrangement, the same combination of two rectilinear motions is used to cause the whole surface of the pattern to pass under the tracer; but one of these motions is used to produce a rotation of the work on its axis only, while it is allowed to move in the direction of its length with the other; so that, if the floating table, or rather frame, is moved from right to left, the work simply revolves on its axis, and makes one entire revolution in the same time that the flat pattern is passing its whole width under the tracer; to ensure which with accuracy, of course the width of the pattern must be exactly equal to the circumference of the cylinder; and if the frames are moved backwards or forwards on the bed-rails, then both pattern and work are moved in the direction of their length only; while any combination of these motions of the frame will produce similar compound motions in the surface of the cylinder, and, consequently, the pattern formed on the cylinder would print a facsimile of the guide from which it is cut.

The patentee claims, First,—the improvement in machinery for cutting, carving, and engraving, wherein the tracer and cutter or cutters are moving simultaneously over the pattern and work respectively in one plane, while the pattern and work have their motion simultaneously in another plane, at right angles to it. And, Secondly,—the improvement in machinery for the purposes aforesaid, wherein the surface of a cylinder is cut, carved, or engraved from a flat pattern or guide; the tracer and cutter or cutters moving simultaneously over the patterns and block respectively in one plane; the pattern and work having their motion simultaneously in another plane, at right angles to the former, as above described.—[*Inrolled in the Inrolment Office, August,* 1845.]

To Squire Diggle, *of Bury, in the county of Lancaster, machine-maker, for certain improvements in looms for weaving.*—[Sealed 11th January, 1845.]

These improvements in looms for weaving consist in the novel and peculiar adaptation or arrangement of a certain construction of endless chain, formed of various shaped links, and acting as tappets or wipers, for the particular purpose only of lifting the shuttle-boxes in power looms, wherein two or more shuttles are employed for weaving fancy goods, particularly stripes, checks, or ginghams. The improved construction of tappet chain for this purpose is capable of diversifying the width of the stripe or check to the extent required in fancy goods, checked goods, or ginghams, by so arranging the tappets or links that any particular shuttle may be kept up during any given number of "picks" or shoots of which it is desired to form the patterns, simply by introducing tappets or links, of different heights or elevations, and by arranging one, two, or more tappets or links of the same heights in contact with, or successively following, each other in "the round" of the pattern or chain (which arrangement will readily present itself to the practical weaver), as may be required to suit weaving striped or checked patterns or designs.

In Plate XVIII., fig. 1, is a front view of a power loom, arranged with three shuttles, and adapted for weaving gingham, and fig. 2, is an end view of the same; fig. 3, is a front view, and fig. 4, a side view of the improved linked tappets or wipers, and the parts by which they are actuated, and also the parts in connection with the shuttle-boxes, drawn upon a larger scale, and detached from the loom; and fig. 5, represents the several tappets or wipers employed, each being shewn separate, or with its connecting pins removed. The framing of the loom is shewn at A, A, supporting the warp-beam B, the main driving or crank-shaft C, and the vibrating lathe or slay D. In this case the slay is furnished with three shuttle-boxes E, E, E, for containing the several shuttles, which are filled with the various colors or qualities of wefts as required; F, is the work or cloth passing over the breast-beam G, to the cloth-roller H.

The application of the invention will be readily understood by the following description:—An endless chain, of any required length (according to the pattern), is formed by connecting any number of the links, tappets, or wipers *a, b, c, d, e, f, g*, (see fig. 5,) together, by means of a stud or pin *h*, passed through the eyes or holes in the tappets. A chain thus composed, and suitable for working three shuttles successively, is shewn in figs. 3, and 4, and applied in the relative position to the loom in figs. 1, and 2, for the purpose of lifting the shuttle-boxes. This chain is to be placed over or upon a small barrel or drum *i*, notched on its periphery, so as to receive the ends of the connecting-pins *h, h*, and thus enable the chain to be shifted round: the drum *i*, is keyed upon a stud or shaft *k*, attached to the loom side. Power being communicated to the crank-shaft c, the pinion *l*, keyed fast upon its extremity, is caused to rotate, and being in gear with a spur-wheel *m*, mounted on a stud in the loom side, communicates motion thereto. In this wheel *m*, a crank-pin or bowl *n*, is placed, which, at every revolution of the wheel, acts against the tail of the vertical lever *o, o*, which vibrates upon the fulcrum *p*, also fixed to the loom side. At the upper end of the lever *o*, a pall or catch *q*, is attached, which, as the lever vibrates, takes into a notched or ratchet-wheel *r*, keyed on the shaft *k*, and pulls the barrel *i*, gradually round, and thus shifts the chain, presenting the tappets thereon to the bowl *s*, mounted in the top lever *t*. This lever swivels on a stud at one end, having the other end attached to the shuttle-boxes, by means of the wire or cord *u*. It will now be seen, that the plain tappets or link *a*, will raise the top shuttle for the first pick of weft; and if any given number of picks is required from that shuttle more than the time that this tappet will keep it up, then another of these links or lowest tappets *a*, must be put in the chain. Next comes a tappet *b*, with a second height or elevation, to lift the second shuttle-box; and if the raised position is required to be continued, in order to form the pattern, a tappet, of the form shewn at *f*, or *g*, must be put next in the chain. When the third shuttle-box is to be lifted, a tappet or link of a third height or elevation is put next in succession in the chain, such as

that shewn at *c*; and if the shuttle is here required to be kept up a continuation link such as *d*, or *e*, must next be introduced in the chain, and so on in an exactly similar manner for any number of shuttles required, or for any number of picks required to be made from the same shuttle.

The patentee claims the method or means of lifting the shuttle-boxes, whether applied, as exhibited in the drawings, above the crank-shaft, or modified in its arrangement, and placed below the crank-shaft of power looms.—[*Inrolled in the Petty Bag Office, July,* 1845.]

Specification drawn by Messrs. Newton and Son.

To JOHN LOACH, *of Birmingham, in the county of Warwick, manufacturer, for a certain improvement in corkscrews; which improvement is also applicable to cocks or taps and valves.* [Sealed 7th May, 1844.]

THIS invention consists, firstly, in a peculiar construction of corkscrew, the screw of which enters into the cork, and afterwards raises the same, by an uninterrupted or continuous rotation; and secondly, in a similar application of a screw for raising and lowering the plugs of cock or taps, and also valves generally.

In Plate XVI., fig. 1, is a section of the improved corkscrew. *a*, is a steel screw, attached to the rod *b*, which is connected to the handle *c*, and has a shoulder b^1, on its lower end. *d*, is a cylinder or tube of brass, commonly called the barrel, having a shoulder d^1, to rest on the mouth of the bottle; at the top of this tube is a smaller tube *e*, of such an internal diameter as to admit of the shoulder b^1, working freely therein, as high as the shoulder e^1; in the upper part of the tube *d*, is fixed a plate or diaphragm *f*, with a hole in its centre through which the shoulder b^1, can pass freely; and on the under side of the plate *f*, are two pointed studs *g, g*.

The mode of drawing a cork with this corkscrew is as follows:—The corkscrew, with its screw *a*, in its highest position, is placed on the mouth of the bottle, as shewn by the dotted lines at *h*; the screw is then caused to enter the cork, by turning the handle *c*, until the shoulder c^1, rests on the

top of the tube *e*; and the turning of the handle being still continued, the action of the screw upon the cork will gradually withdraw it from the bottle.

The cork is disengaged from the corkscrew in the following manner:—The tube *d*, must be held in one hand, and the handle *c*, in the other; on raising the handle *c*, into a position intermediate between its highest and lowest positions, the top of the cork is brought in contact with the studs *g*, *g*; the handle *c*, is then turned round in a direction contrary to that in which it was turned in drawing the cork, and at the same time drawn gently upwards (the cork being prevented from turning by the studs *g*, *g*); and thus the screw will be withdrawn from the cork;—on pressing down the handle *c*, the cork may be removed from the end of the screw *a*, by hand.

The application of this invention to cocks or taps is shewn at figs 2, 3, 4, and 5; fig 2, representing a longitudinal section of the cork; fig. 3, its plug and screw; fig. 4, the cap or cover; and fig. 5, the key for opening and shutting the cock. *a*, is the pipe for conveying the liquid into the chamber *b*, in which the plug or valve *c*, works; and *d*, is a short pipe or nozzle for discharging the water. The plug is formed partly of brass, and partly of an alloy of equal parts of lead and tin (other alloys may be used, but the one described answers every purpose); the lower part is conical, and fits closely on the conical bed b^1, of the chamber *b*; and on the upper part of the plug, at opposite sides, two pins *f*, are fixed, which work in grooves *e*, in the sides of the chamber *a*, and prevent the rotation of the plug. *g*, is a left-handed screw, which works in a female screw, formed in the plug; it has a broad shoulder *h*, at top, fitting into the recess h^1, in the upper part of the cock (a leather washer being placed both above and below it); and above this shoulder is a small chamber or box *i*, to receive the key *j*. When the plug and screw are in their places, the cap *k*, is screwed on the top of the cock: this cap presses on the shoulder *h*, and keeps the plug and screw in their proper positions.

It will be readily understood from the above description, that if the key *j*, be inserted in the box *i*, and turned round

towards the left-hand, the rotation of the screw *g*, will raise the plug, and the liquid will be discharged through the cock; and that if the key is turned in the reverse direction, the plug will be lowered, and the flow of the liquid stopped.

The following is the mode of constructing the plug *c*:—The central portion of the plug, wherein the female screw is formed, is made of brass; it is tinned on the outside, and introduced into a metal mould, the interior of which is of a suitable shape for forming the exterior of the plug; the alloy is then fused, and being poured into the mould, attaches itself to the tinned brass. When the plug has cooled, it is placed in a die of the exact form and size of the valve-chamber *b*, and is subjected to pressure, which causes every part of the plug to fit the die accurately, and consequently the valve-chamber.

In applying this invention to the opening and closing of valves generally, a screw is employed for that purpose, in the manner above described with respect to cocks or taps.

The patentee claims, as his invention, the method of constructing cork-screws above described, by which method of construction the cork is raised on the thread or worm of a screw; the said screw being made first to enter, and afterwards raise the cork, by an uninterrupted or continuous rotation of the said screw.

He further states, that, although he has described the best method of carrying his invention into effect, with which he is acquainted, yet he does not confine himself to that method; but claims the exclusive right to the construction of cork-screws, in which the cork is raised by the rotation of a screw in the said cork; whether the screw be constructed and applied in the manner above described, or in a different manner. He also claims the application of a screw to the raising and lowering of plugs or valves in cocks, taps, and valves generally; the said plugs or valves being prevented from rotating while being raised and lowered, in the manner above described, or in any other convenient manner.—[*Inrolled in the Inrolment Office, November,* 1844.]

To John Naylor, *of Goole, in the parish of Snaith, in the West Riding of the county of York, agricultural implement maker, for improvements in the machinery or apparatus for crushing, tearing, and pulverizing arable land.*—[Sealed 31st May, 1845.]

This invention relates to that class of agricultural implements known as spiked rollers. The improvements consist, firstly, in forming the spiked roller or rollers of several short metal cylinders, of the same diameter, set on one common axle, in close contiguity to each other in the direction of their length, and having liberty of motion independent of each other; but, when required, they can be fixed together, so as to form one long roller. Secondly, in so arranging the spikes upon the circumference of the rollers that each spike is successively brought into action. Thirdly, in causing the spikes to enter more or less deep into the earth, by means of certain apparatus applied to the frames which carry the axes of the rollers.

In Plate XVIII., fig. 1, is a plan view of the machine, with the rollers removed; fig. 2, is a vertical section, taken at the line 1, 2, of fig. 1; fig. 3, is a back elevation; fig. 4, is a plan view, looking from beneath; and figs. 5, and 6, are detached views of some parts of the machine. A, A, is the framing of the machine, the ends B, B, of which are formed with vertical slots C, C, for the axles D, D, of the running-wheels E, E, to pass through. To the inner ends of these axles the lower ends of the vertical racks F, F, are fastened, their upper ends moving in contact with antifriction rollers G, G. H, is a shaft, extending lengthwise of the framing, mounted in bearings I, I, and carrying, near its centre, a bevil-wheel J, which takes into a bevil-wheel K, upon the shaft L;—M, is a ratchet-wheel, fixed upon the shaft L;—N, a catch, taking into the ratchet-wheel; and O, a lever handle, upon the end of the shaft L, for actuating the bevil gearing J, K, and parts connected therewith; P, P, are pinions, fixed on the ends of the shaft H, and taking into the vertical racks E, E. Upon motion being communicated to the pinions by means of the

handle O, the frame A, will be raised or lowered, as may be required. Q, Q, Q, are three spiked rollers or cylinders, placed end to end, and revolving loosely on the shaft R, fixed to the ends B, B, of the framing. Q^1, Q^1, Q^1, are three similar rollers, turning loosely on the shaft S; the ends of this shaft are supported in bearings T, T, which can be moved along the framing A, A, to increase or diminish the distance between the rollers Q, and Q^1, and are retained in any required position, by passing bolts 1, 2, through the bearings, and through slots in the framing A, A, and screwing the nuts 3, 4, upon their ends.

In order to reduce the friction of the working parts of the rollers upon the shafts R, and S, and render the draught of the machine more easy, the patentee encloses the ends of the rollers Q, Q, and Q^1, Q^1, within the castings U, and V, (an enlarged view of which is shewn at fig. 5); and each pair of castings U, and V, are connected together by pins 5, 6, or in any other convenient manner, so that the castings may readily adapt themselves to any change in the position of the shaft S. By this means the ingress of stones or dirt between the ends of the rollers is prevented. When it is desired to connect either the rollers Q, Q, Q, or the rollers Q^1, Q^1, Q^1, together, so as to form one or two long rollers, the collars W, W, are turned upon the screwed ends of the shafts R, or S, (see fig. 6,), which will have the effect of moving the two end rollers Q, Q, or Q^1, Q^1, up flush with the centre roller Q, or Q^1; and their serrated or jagged edges interlocking, they will all turn together as one roller. On the collars W, W, being turned in the reverse direction, the rollers will be again separated, and become independent of each other.

The peculiar mode of fixing the spikes will be understood on referring to figs. 3, and 4, in which it will be seen that they are arranged in a helical direction upon the rollers, and at such distances apart that the spikes will come into action in succession. The depth to which the spikes enter the ground may be adjusted by turning the handle O, and thus raising or lowering the frame A.

The patentee claims, Firstly,—the general combination and arrangement of the several parts, as constituting an im-

proved machine or apparatus for the purposes above mentioned. Secondly,—the application of hollow metal spiked rollers to the purposes of this invention, the spikes whereof are arranged and disposed in the manner above described. Thirdly,—the general combination and arrangement of the parts employed for adjusting the spikes, whereby they are caused to enter more or less deeply into the earth, as above described. Fourthly,—the arranging or connecting of the shaft or axle S, to the framing of the machine, by and in moveable bearings T, T, whereby the integral roller or series of rollers Q^1, Q^1, Q^1, composing the same, may be adjusted within a limited distance of the rollers Q, Q, Q, for the purposes of this invention, as above described.—[*Inrolled in the Rolls Chapel Office, November,* 1845.]

To ALFRED VINCENT NEWTON, *of the Office for Patents,* 66, *Chancery-lane, in the county of Middlesex, mechanical draughtsman, for an invention of certain improvements in machinery or apparatus for forging and stamping metals; applicable also to other useful purposes,—being a communication.*—[Sealed 7th April, 1845.]

THESE improvements in machinery for forging and stamping consist in a peculiar method of raising a vertical hammer and letting it descend upon the substance placed beneath it. By this machinery, substances which require the exertion of great force may be forged and hammered; and, by substituting a cutting or chipping tool in place of the hammer, the apparatus may be employed with great effect in dressing and chipping stones, and in other works of the like nature.

In Plate XVI., fig. 1, is a side view, and fig. 2, a plan or top view of the improved apparatus. A, A, is the frame, the beams A^1, A^1, of which may extend into the side walls of the building, or be otherwise supported. From these beams descend two vertical timbers A^{11}, A^{11}, which are shewn as sustained by the braces A, A; the vertical timbers A^{11} A^{11}, serve as cheeks to receive the guides of the hammer B, which rises and falls vertically between them. A part of the tim-

ber-work constituting the frame is removed, for the purpose of shewing the various parts of the machinery more clearly. C, C, is an iron stock or socket, to receive the hammer B, and is furnished with grooves *a, a*, to receive the guide-tongues, which are attached to the inner side of the vertical timbers. Upon the upper end of this stock C, is attached the lifting-rod D, D, which is represented as a square bar of iron. The mode of attaching this rod to the head of the hammer-stock is, by passing it into a cavity in the upper end thereof, and surrounding it by a strong spiral or other spring *b, b*, to prevent a sudden jerk in the first impulse of raising the hammer; a spring may also be inserted to relieve the lifting-rod in its descent, and prevent its upsetting. The lifting-rod D, D, extends upwards, and is received between two friction-drums E, E^1, which embrace it firmly when the hammer is to be lifted. These friction-drums are mounted on their respective shafts F, F^1, which run in plummer-blocks, in the usual way. Upon the same shafts are the toothed wheels G, G^1, which, gearing together, cause the friction-drums to revolve simultaneously in opposite directions. H, is a driving-pulley, to which motion is to be communicated by a band from any first mover, in order to actuate the machine. I, is a pinion, on the shaft of the said pulley, gearing into the toothed wheel J, on the shaft of the friction-drum E. The friction-drum E^1, has its shaft F, on a sliding frame K, K, which is allowed to traverse backwards and forwards a short distance, so as to cause the lifting-rod D, D, to be embraced between the friction-drums, or leave it free, as may be required. L, L, is a toggle-joint, by which the motion of the sliding frame is governed, in a manner to be now described.

Upon the shaft F^1, are fixed two or more cam-wheels M, M^1, M^{11}, which determine the number of strokes that the hammer shall make in one revolution of the friction-drums. When the hammer is to make one stroke only, a portion of the periphery of the cam-wheel that regulates it is cut away in but one place; where two strokes are to be made, the periphery of the cam is to be cut away in two places, as seen at *c, c*, on the wheel M, fig, 1. Each of the cam-wheels has assigned to it an apparatus which is under the control of the

forgeman, allowing him to bring one or the other of them into action at pleasure; as this apparatus is similar in each, a description of that which governs the wheel M, will serve for the whole. N, is a rocking-shaft which crosses the machine, and has its end bearings in the timbers or beams A^1. O, O, is a lever, which has its fulcrum on the shaft N, on which it turns freely; *d*, is a catch, working on a fulcrum-pin, which projects from the lever O, and is intended to take into a notch on the shaft N, or on a collet *e*, made fast thereto. On the inner end of the lever O, there is a friction-roller *f*, bearing against the periphery of the cam-wheel M. *g*, and *h*, are cords, attached to, and operating upon, the lever O, near its opposite ends. When the cord *g*, is drawn down, it forces the friction-roller *f*, against the periphery of the cam-wheel; and when the cord *h*, is drawn down, it performs the double action of relieving the catch *d*, from the notch in the collet *e*, and drawing the roller *f*, from its contact with the cam-wheel; this is effected by attaching the end of the cord *h*, to the outer end of the catch *d*, and passing it over a pulley *i*, on the upper side of the lever O. This catch *d*, is forced against the collet *e*, by a spring *j*, which causes it to catch in the notch when the catch is brought into the proper position by the action of the cord *g*. P, P^1, is a lever, keyed to the rocking shaft N; its inner end extends nearly into contact with the lifting-rod D, for the purpose to be presently explained; and its outer end P^1, is connected with the arm Q, by which the toggle-joint L, is raised or lowered; R, is a connecting-rod, furnished with nuts, by which the play of the toggle-joint may be adjusted; S, is a spring, intended to assist the action of the toggle-joint, and the parts connected therewith; T, T, are adjusting screws, by which the toggle-joints may be set, so as to regulate the action of the sliding-frame K, over the metal bed at the top of the horizontal beams A^1. A strong spring *k*, *k*, receives the immediate action of the toggle-joint L, and bears against the outer end of the sliding-frame K. This spring serves to compensate for any want of truth in the friction-drums, or in the lifting-rod D; causing the former to bear equally on the latter. U, fig. 2, is a clutch, operated on by the rod V, fig. 1, and serves to throw the machine into and out of gear.

When the machine is in action, the friction-drums E, E^1, revolve in the direction of the arrows, and by drawing down the cord *g*, the notch on the collet *e*, will be moved round, so as to receive the catch *d*, which will cause the lever O, to be temporarily attached to the rocking-shaft N; and the revolution of this shaft will force the toggle-joint up, by the action of the lever P, affixed to the said shaft; and the friction-roller *f*, on the lever O, will also be borne up against the periphery of the cam-wheel M. The friction-drum E^1, will then be forced into contact with the lifting-rod D, and the hammer will be raised. When the roller *f*, arrives at one of the recesses *c*, in the cam-wheel, the outer end of the lever O, will be depressed, and with it the toggle-joint. The hammer-rod D, being, by this motion, relieved from the pressure of the drum G^1, it will descend by its own weight, and being guided, in its descent, by the V-guides on the framing, as before mentioned, will fall directly upon any substance placed beneath it to receive the blow. It will now be seen, that any number of strokes may be given by the hammer during the revolution of the cam-wheel, this being dependent upon the number of recesses made in its periphery.

A most decided advantage resulting from this arrangement is, that a blow of equal force may be given to the article which is being forged, whatever may be its thickness, so long as the same cam-wheel is kept in action; as the height to which the hammer is lifted will always be the same, measuring from the point where it is arrested. With the common trip-hammer, the larger the size of the iron to be forged, the shorter is the stroke of the hammer, when it should, in fact, be the greatest.

In blooming iron, it is stated that this improved hammer will be found exceedingly advantageous, for should the forgeman wish to change the force of the blow, it can be done instantaneously, without stopping the machine; all that is necessary being to pull the cord *h*, which will relieve the catch *d*, and remove the lever O, from its cam-wheel; and by drawing at the same time upon another cord attached, like *g*, to the lever of another cam-wheel, such wheel will be set into action.

Should the forgeman desire to vary the force of the blows

in such a manner as to strike irregularly on any piece, this may be done by the aid of the lever P, to the longer end of which a chain W, is attached for that purpose; the other levers being thrown out of action, the forgeman may take hold of the ring on the end of the chain, and by alternately drawing the lever P, down, and suffering it to rise, he may keep the cam-wheels in contact with the lifting bar for such a length of time, or as frequently as he may desire; for every time he draws upon the chain, the friction drums will grip the bar, and on ceasing to draw on the chain, the hammer will fall.

The lever P, as before remarked, is made to extend nearly to the lifting rod; and this is necessary to the security of the apparatus; as, without this device, should the forgeman neglect to relax his draught upon the chain, the hammer-stock would be brought into contact with the friction drums and destroy the machine; but under the arrangement above described, the head of the stock will be brought up against the end of the lever P, and cause the hammer to fall. Another precaution is necessary to prevent injury from throwing more than one of the levers O, into gear at the same time, namely, that the cam-wheels should be so placed upon the shaft E^1, as that one of the recesses on the periphery of each of them shall be in the same horizontal line; this precaution will secure the falling of the hammer in one revolution of these wheels, whatever may be the number of them in action.

In the drawing a spiral spring S, is shewn, to insure the prompt descent of the toggle-joint, by attaching one end of such spring to the outer end of the lever P. It may also be found advantageous to attach spiral or other springs to the sliding-frame K, to aid in drawing it back when the friction-rollers *f*, enter the recesses on the cam-wheels.

The patentee claims, First,—the manner of operating upon the lifting rod by means of the friction drums, one of which is made to advance to and recede from the lifting rod, by being placed on a sliding-frame, which is operated upon by a toggle-joint, or other analogous mechanical arrangement of parts; and, Secondly,—the manner of arranging the respective levers O, and P, the catch *d*, the cam-wheels M,

and their appendages, so as to be operated upon by the cords and chain attached to the said levers, as herein set forth and described.—[*Inrolled in the Petty Bag Office, October,* 1845.]

Specification drawn by Messrs. Newton and Son.

To WILLIAM PALMER, *of Clerkenwell, in the county of Middlesex, manufacturer, for improvements in working atmospheric railways, and in lubricating railway and other machinery.*—[Sealed 5th June, 1845.]

THIS invention consists in the application of tallow-oil or other fatty matter, prepared in the form of an insoluble soap, to line the tubes of atmospheric railways, and for lubricating railway and other machinery.

The tallow-oil is heated to about the boiling point, and then litharge is stirred in, until the tallow-oil will not take up any more, and the litharge falls to the bottom; the stirring is continued for half an hour after the addition of the last quantity of litharge, and then the melted matter is removed into casks or other suitable receptacles. By this means a soap, insoluble in water, is produced. The patentee does not confine himself to the use of tallow-oil, as other fatty matters or oils may be used, combined with litharge or other metalline matters suitable for converting them into an insoluble soap.

When the insoluble soap is used for the purpose of lining or smearing over the interior of the traction tubes of atmospheric railways, one-fourth of its weight of hard unsaponified tallow is mixed therewith by melting; for lubricating the piston rods of steam-engines and other machinery, more or less tallow or fluid oil is added, according as the mixture may be required to melt more or less readily.

The patentee claims the application of tallow-oil, or other fatty matters or oils, prepared in the form of soap, insoluble in water, by means of litharge or other metalline matters, to line the interior surfaces of the traction-pipes of atmospheric railways, and also for lubricating machinery, as above described.—[*Inrolled in the Inrolment Office, December,* 1845.]

Scientific Notices.

ON THE USE OF MADDER IN DYEING AND PRINTING CALICOES, &c.

BY M. SASS.

(Translated from the "Bulletin de la Société d'Encouragement" for the London Journal.)

[Continued from page 291.]

There are seven principal points to be considered in the process of Maddering: 1st.—The quality of the water to be employed in dyeing. 2nd.—The quantity of water to be used with a given proportion of madder. 3rd.—The degree of temperature most favorable to the operation. 4th.—The length of time necessary for the dyeing process. 5th.—The effect produced by lowering the temperature of the bath. 6th.—The quantity of madder necessary for the saturation of a given proportion of mordants. 7th.—The degree to which it is necessary to heat the dye-bath in order to extract the coloring matter.

I. The nature of the water to be employed for dyeing ought to be carefully studied, as it materially affects certain colors. Thus, for example, perfectly pure water, possessing no re-agent, is the best for all madder dyes, with respect to the brightness of the colors, except violet. Calcareous water, on the contrary, will not produce such fine reds and pinks as the pure water, the colors produced by the latter being always more or less dull and tinged with violet; but it produces much better violets than the pure water. There are two kinds of calcareous water; the one holding sulphate of lime in solution, and the other charged with carbonate of lime; the former cannot be used, as it tarnishes the shades, and precipitates the bath of soap, which alone gives to the madder-dyed colors the required brightness: the latter can always be used, whatever may be the quantity of carbonate with which it is charged.

Water charged with metallic salts must not be used; ferruginous water, for instance, if employed, would decompose the soap-bath, tinge all the alumina mordants a violet hue, and stain the white parts of the fabric.

Sulphurous water is likely to injure and stain iron mordants, but will probably not act upon aluminous mordants, provided it does not contain any metallic salts in solution.

Experiments have been made to test the action of certain substances when added to the madder-bath, and the result produced has been unfavorable in all cases; perhaps these substances have been added in too great quantity in proportion to the

madder employed. The experiments made were as follows:—A mixture of 31 grammes of nitric acid at 40° Beaumé and a quart of cold water was thrown upon 500 grammes of madder, the whole being well stirred. The next day 186 grammes of the mixture were diluted with 8 quarts of water; the specimen dyed (with all the precautions taken) was of a lighter red than another piece dyed with one third of that weight (viz. 62 grammes) of unprepared madder. On increasing the quantity of acid it was found to remove the mordant, and render the dyeing operation impossible. 31 grammes of olive oil soap, and 62 grammes of madder, only produced a very feeble color.

The same quantity of glue dissolved in water, and 62 grammes of madder, produced but a dull light red. This result was surprising, inasmuch as this mixture was recommended by *Berthollet*, as being almost as favorable to the operation as nut-galls, and had been frequently employed at Chantilly, for making carpets, the blue ground of which changed whenever the precaution was not taken of adding to the dye-bath 31 grammes of glue for every 500 grammes of madder; it was not observed that by this addition a larger proportion of coloring matter was required. From these facts we may conclude that the contrary result, obtained in our experiment, was solely owing to our having used gelatine, the weight of which is half that of the madder.

186 grammes of a mixture composed of 31 grammes of Tuscany potash, 500 grammes of madder, and one quart of water, produced a very light pink tinged with lilac.

186 grammes of a mixture made with 31 grammes of slacked lime, 500 grammes of madder, and one quart of water, produced a very light yellowish pink.

186 grammes of a mixture made with 500 grammes of madder, and one quart of water, containing 31 grammes of sulphuric acid, at 66° Beaumé, furnished a very light pink, and carried off the mordant in several places.

31 grammes of chalk, and 62 of madder, furnished a very light dull red.

The substances were added to the dye-bath in large quantities, in proportion to the weight of the madder, in order to be able to judge more accurately of the action of each of them; but their comparative utility was lost sight of, as at least two of them, viz. chalk and glue, are known to be useful. These experiments are so delicate, that, in order to arrive at definite conclusions, mere experiments in the laboratory are not sufficient,—they must be made on a large scale.

Besides, many circumstances may alter the action of the substances added to the madder-bath for the purpose of drawing from it the greatest possible quantity of coloring matter; at least one is tempted to believe this in consequence of the following experiments made for the purpose of discovering in what state nut-galls are most advantageously employed in maddering.

On mixing 31 grammes of pounded nut-galls, or sumach, with 62 grammes of madder, in 8 quarts of water, the alumina mordants dyed therein only take a dull brown color; whilst if, after dunging the fabrics, it is passed for a quarter of an hour through a bath at 80° Reaumur, made with the same quantity of nut-galls or sumach, and afterwards dyed with the same quantity of madder as in the preceding experiment, a fine red is obtained, deeper than that of a third specimen, dyed in the same manner, but without having been previously galled. By adding a solution of nut-galls to the mordant before printing, scarcely any mordant remains in the fabric after dunging. It may be concluded from these facts, that the nut-galls only exert all their influence upon the coloring matter of the madder when combined, before dyeing, with the mordant previously fixed in the fabric by degumming. It is probable that in the first case, the galls hindered the dyeing operation by precipitating the coloring matter, and that in the second, it facilitated it by increasing the absorbent properties of the mordant. This would perhaps explain the well known fact, that fabrics dyed twice are always of a deeper and brighter color than those only dyed once, although the same quantity of madder be employed. In the third case, the galls prevented the mordant from being properly fixed in the fabric, because by its infusion it precipitated the salts of alumina. Wheat bran coarsely ground, mixed with the dye-bath, in equal quantity to the madder, will produce a tint of not half the depth of those obtained with the same quantity of madder alone; on the other hand, the white part of the fabric is much less charged with color, provided the precaution be taken of washing them immediately on coming from the dye; without which, the coloring matter will become fixed therein with such tenacity, that it is almost impossible to separate it. Dung added to the dye-bath produces the same effect as bran.

II. The most advantageous quantity of water to be employed with a given quantity of madder can only be determined by approximation; experience shews that 30 quarts are necessary for every pound of ordinary madder. No disadvantage has been found to arise either from increasing or diminishing the quantity of madder, relatively to this quantity of water, up to certain limits, beyond which the coloring matter will not unite with the fabric, as it is carried off by the excess of water, or retained by the mucilage of the madder, which prevents it from dissolving.

III. The degree of heat suitable for commencing the dyeing operation, is a matter of much dispute among practical men; some maintain that it must be as high as 30 or 40° Reaumur, whilst others, who form the majority, contend that it is better to dye with a cold bath: all, however, agree that it must neither be down to 0°, nor up to the boiling point. In order to arrive at a correct conclusion on this head, the following experiments were made. A piece of calico, perfectly bleached, was cut up into

pieces of about 16 inches long, and ten inches wide, which were immersed altogether in pure acetate of alumina, at 10° Beaumé, for about five minutes, pressed, wrung by hand, and hung up in a rather moist drying apparatus at 15° Reaumur, during two nights and three days. The third day they were dunged at 65° Reaumur, and were then severally dyed in dye-baths, prepared in a copper-vat, with 8 quarts of pure water, and 31 grammes of the best madder, and stirred constantly the whole time with a small fir stick. The temperature of each bath was indicated by a thermometer.

No. 1	put in at 10° R. heated in 1 hour to 80°, and taken out.	These three specimens are of a uniform light red tint.
No. 2	20°	
No. 3	30°	
No. 4	40°	Of a uniform red, but a richer color than the three preceding.
No. 5	50°	
No. 6	60°	
No. 7	70°	Deeper than No. 6.
No. 8	80°	The same tint as No. 6.

These experiments prove that it is better to commence the operation above 30° R. than under; this fact is corroborated by practical experience, which shews that great economy is effected in the madder by carrying the temperature up to 40° R.; moreover, that the most advantageous heat for commencing the operation is 70° R. It is, however, to be regretted that it cannot be employed on a large scale with facility, as the workmen are not able to fasten the pieces together, end to end, at so high a temperature, without burning themselves; it is besides probable that that degree of temperature would produce stains, especially for designs with a ground; the movement of the piece not being sufficiently rapid to plunge all parts of it into the dye-bath at the same time, the action of which would, no doubt, be almost instantaneous. It will be seen presently that this degree (70° R.) is also the most advantageous temperature at which to stop the operation; lastly, that the boiling point, far from being favorable to the combination of the coloring matter with the mordant, seems, on the contrary, to separate a portion of that which had already united with it.

In winter, during frost, it is customary to make the madder-bath lukewarm, because it is impossible to dye at 0° R., as the coloring matter does not dissolve properly. If the bath is too cold to speedily melt the small icicles adhering to the pieces (which must always be most carefully avoided, as frost affects the mordants), whitish stains will be produced wherever they existed.

IV. The duration of the operation of dyeing varies according to

the colors to be produced; it is generally a single dip of three hours for reds, violets, and browns, and two dips of an hour and a half each for pinks, the fabrics being put in at 20 or 30° R., which temperature is raised to from 40 to 50° R. No attempt has been made to ascertain the time necessary for completely exhausting the madder by means of the printed pieces, as this question relates to the chemical composition of the madder.

V. The effect of lowering the temperature of the dye-bath has been ascertained by means of samples prepared as in the preceding experiment. The madder-bath was heated, in a quarter of an hour, to the degree indicated, stirring it constantly; it was then removed from the fire, and left uncovered, for twelve hours, in stone vessels of equal size, to cool; at the expiration of which time, the bath was employed, as in the preceding experiments. In each of these experiments, 31 grammes of the best madder were used.

No. 1 heated to	10° R.	and left at that temperature.	All these pieces were of the same light red tint.
No. 2	20°	....	
No. 3	30°	....	
No. 4	40°	....	
No. 5	50°	....	
No. 6	60°	....	
No. 7	70°	....	
No. 8	80°	....	This piece did not take the color, being scarcely stained.

We may conclude from this, that below the boiling point, the dye-bath may be lowered a few degrees, without the least inconvenience; but it is not so at 80° Reaumur, as the bath, if heated to that degree, and afterwards cooled, becomes useless. It would seem that the coloring matter then becomes insoluble; at any rate the water floating upon the madder (which is precipitated by cooling) is perfectly limpid, being scarcely tinged with an amber tint.

It would be interesting to know whether the coloring matter which disappears is absorbed by the ligneous matter, or retained by coagulated matter; the microscope would be very useful in this inquiry.

VI. The proportion of madder to be employed, to saturate a given quantity of alumina mordant, can only be ascertained with correctness when the coloring matter is separated, (as this varies according to the kind of madder, and even in different portions of the same, according to its age, its degree of dryness, the salts it contains, and the treatment it has undergone), and when a definite combination of that and the alumina has been effected. This I believe to be impossible, judging from eight experiments made with the precautions above-mentioned, excepting that I employed an alumina mordant of less strength (2½° Beaumé), in order to obtain clearer tints.

The experiments were begun at a temperature of 12°, and were heated in an hour to 80° R., and kept at that temperature for a quarter of an hour; the pieces were then soaped for a quarter of an hour at 65° R., in 24 quarts of water, with 64 grammes of white soap, then brightened, in the same quantity of water, with a solution of tin in *aqua regia*, washed in running water, and soaped as before.

No. 1	31	grammes of madder	bright pink.
No. 2	64	....	light red.
No. 3	95	....	intensely bright red.
No. 4	126	....	deep red.
No. 5	157	....	little more intense than No. 4.
No. 6	188	....	one-third deeper than No. 4.
No. 7	250	....	little deeper than No. 6.
No. 8	500	....	one-fourth deeper than No. 7.

These experiments would seem to prove that the quantity of madder necessary for dyeing a piece of calico about 50 yards long, by 1 yard wide, a fine red color, is about 76 lbs., but experience demonstrates, that from 20 to 24lbs. suffice for obtaining the deepest red; therefore, in these experiments all the coloring matter was not extracted from the madder, which was to be expected, as the operation was performed in one-sixth of the time usually taken when working on a large scale.

Great difficulty is found in saturating the alumina mordants with coloring matter, if indeed they are ever completely saturated, from which I am led to believe that a definite combination of the coloring matter and the alumina does not exist, and that beyond a certain limit, the intensity of the color is not increased in proportion to the quantity of madder employed, but deepens less rapidly; this is proved by No. 8, the shade of which is only one-fourth deeper than that of No. 7, although the dye-bath was charged with double the quantity of madder.

VII. *Of the degree to which it is most advantageous to heat the dye-bath.*—Experience has shewn that the more the dye is heated beyond a given temperature, the less coloring matter is extracted, and the shade of the red mordants is less bright; but mordants of iron, tin, alumina and iron, and alumina and tin, are not affected by this treatment. These facts being known, the latter are always dyed at the boiling point, and the former at 65° R. as the maximum; pinks are always dyed at from 40 to 55° R., their tint being brighter in proportion as the degree at which they are worked is low.

In order to ascertain the degree at which the coloring matter of the madder begins to unite with the alumina mordants, and also the degree at which it unites with them in the largest proportion, I made the following experiments, with the same precautions as in the preceding operations.

No. 1 immersed at a temperature of 13° R., left an hour in the bath, continually stirred, and then taken out:—the fabric was scarcely tinged with a yellowish tint.

No 2 immersed at 13° R., and heated in one hour to 20° R.—same tint as No. 1.

No. 3.............. 30°—a fine pink.
No. 4.............. 40°—pink 4 times as intense as No. 1.
No. 5.............. 50°—tint twice as deep as No. 4.
No. 6.............. 60°—same as No. 5.
No. 7.............. 70°—much deeper tint than No. 6.
No. 8.............. 80°—same tint as No. 5.

It is therefore at 13° R. that the coloring matter of the madder unites with fabrics treated with alumina mordants, and at 70° R. that it combines therewith in greatest proportion; this degree is therefore the most advantageous for immersing the fabric to be dyed. As has been already observed, upon raising it to the boiling point, a portion of the coloring matter which had become fixed in the cloth, will be separated from it; so that fabrics treated with alumina mordants must on no account be dyed as high as 80° R. The time of immersion may, up to a certain point, be prolonged instead of raising the temperature; for this reason pinks take a longer time than any other color. On coming from the dye, the pieces are plunged in running water and well washed, to free them from the coloring matter not combined with the mordant, and which, being merely deposited upon the surface of the fabric, would stain the white parts if suffered to remain.

After this operation, the parts of the fabric to be left white are still pink; there are two methods by which they may be brought to their former whiteness: according to the first, economy must be sacrificed to the beauty of the shades; and according to the second, the beauty of the shades to economy. The first is the method pursued in Alsace, and the second in Rouen. It is to be regretted that the present demand, by which everything is required cheap, forces the first to assimilate with the latter.

We will pass over the method of bleaching by exposure in the open air, which is generally abandoned on account of its long duration, although its products are perfect.

The method of bleaching in Alsace consists in soaping the pieces at 50° or 65° R., in brightening them, as hereafter mentioned, and afterwards boiling them once in soap. In summer they are exposed in the fields for from three to six days, according to the fineness of the weather, and they are afterwards dipped and soaped at the boiling point; whilst in winter, when this plan cannot be adopted because of the frost, they are boiled several times in soap, after brightening, until perfectly white, which requires sometimes four successive boilings of half an hour each. This treatment, which is very expensive, is used for small designs

containing black and red, or black, red, and pink, which designs can only acquire the beauty peculiar to those of Alsace by this method.

Pinks, brightened very powerfully and afterwards soaped under a pressure superior to that of the atmosphere, always present a perfect white, which is not the case with those less brightened, the white of which must, nevertheless, be in the highest perfection, in order not to tarnish the shade of the design, which is generally printed with the cylinder or roller, and to dye afterwards with different coloring matters, which adhere to all those parts not sufficiently bleached.

We believe the action of the soap to be purely chemical,—alkalis possessing the property of dissolving the coloring matter of madder, but not however without altering it; and soap being nothing but a caustic alkali, the action of which has been moderated, by combining it with a fatty body, which retains the coloring matter and prevents it from being again taken up by the fabric. This fact may be ascertained with certainty by decomposing a soap-bath, which has been well used, by means of an acid,—the fatty acids immediately ascend to the surface, tinged with orange; the bath having from red become almost colorless.

It may, therefore, be admitted that the action of the soap, although essentially chemical, is also in a degree mechanical. Soap possesses another advantage, viz., that of rendering the colors more fast, less likely to be attacked in brightening, and above all, that of giving them a brightness which they would not otherwise acquire; it is probable that this effect is owing to a combination of fatty acid, coloring matter, and mordant.

Exposure to the open air oxidizes, as is well known, the coloring matter; and if the pieces are too long submitted to its action, the colors grow faint and dull, and would even entirely disappear if exposed for a longer time.

Attempts have been made to render this treatment more economical by using hypochlorite of lime, either before or after soaping; which in summer does away with the third and last soaping, and in winter with all the operations used for bleaching; besides, by this method, great economy of time is effected.

The pieces are passed through the hypochlorite immediately after maddering, after the first soaping, after brightening, and either before or after the third soaping, which finishes the operation.

By the first method, the reds are much tarnished, which happens every time they are in contact with soluble salts of lime; black becomes greyish-brown, but a perfect white is obtained.

By the second, and especially by the third, the colors are much less changed than by the first.

The fourth is the only one which gives a fine white ground, and tarnishes the red colors so little, that it may be employed with success; a better result still is obtained by substituting

hypochlorite of soda for hypochlorite of lime; the reds are, however, never so fine as those produced by soap alone.

Hypochlorite of lime does not possess the least disadvantage for bleaching violets and puces; it is everywhere employed for that purpose.

The action of hypochlorites is also oxidizing, but much more active than that of the bases of those salts and the chlorine which is disengaged therefrom during the operation upon the coloring matter; and for this reason this operation ought to be entrusted to experienced hands. Thus, for example, by passing them for too great a length of time through hypochlorite of lime, the iron mordants will be carried off by the chlorine, and black and violet colors will become faint; puce, which is composed of mordant of iron and alumina, reddens by the dissolution of the iron mordant; mordants of alumina, on the contrary, not being attacked by the chlorine, preserve all their intensity, but are turned brown by the lime, which is the base of the salt.

The method of bleaching practised at Rouen consists in alternately passing the fabrics through hypochlorite of lime and bran, or bran and soap. The bran acts as an absorbent, and acquires a red color as the white parts of the pieces re-appear: it does not alter the red coloring matter.

It has been seen that, after dyeing, the pieces are passed through bran or soap before undergoing the brightening process. This operation merely consists in the action of acids of greater or less strength upon dyed fabrics, so as to change the brick-red of those treated with alumina mordants into a bright red, and the black color of those treated with iron mordants to a fine violet.

To brighten alumina mordants for reds, a solution of tin in *aqua regia* is employed; for pinks, a solution of tin and pure nitric acid, or else a compound of equal weights of solution of tin and sulphuric acid;—there is no perceptible difference in the results obtained with these various ingredients.

Iron mordants are brightened with sulphuric acid, or with a solution of tin; this latter, acting more promptly, is rarely used, except in cases where these mordants are combined in the design with mordants of alumina, the tint of which is required to be preserved.

In order to brighten mordants of alumina, the pieces are rapidly plunged in a bath of cold water at 10° R., to which is added a solution of tin, in quantity increasing in proportion to the rapidity of effect and lightness of shade required. With regard to the quantity of solution to be employed, the temperature of the water must be noticed, and a less quantity added in proportion as it is hotter; the operation proceeds, and the pieces are turned or stirred for two or three minutes, in order to spread the solution uniformly in the bath; steam is then gradually introduced, and the bath heated, until the color is softened to the shade

required. The steam-cock is then quickly shut, and cold water introduced; after which the pieces are taken out and washed in running water.

The object of these precautions is to prevent the colors from clouding, which takes place when the brightening bath does not act uniformly upon the whole surface of the piece; the color is therefore apt to become clouded if the brightening bath be heated too much or too rapidly,—if too much of the solution be employed,—if the bath be not stirred before immersion, or if the pieces be not washed immediately after brightening.

The action of the brightening process is twofold, as it acts upon the coloring matter and also upon the mordant which fixes it.

The coloring matter is acted upon very powerfully by the solution of tin; nitric acid may, therefore, be used, either in combination with it, or alone, in lieu of it. From this it may be conceived that the brightening process acts by oxidizing the coloring matter, which is proved by the yellow tint it receives, as is the case with all organic matters containing azote, when attacked by nitric acid.

It is generally supposed that the brightening solution acts also by fixing upon reds a little of the oxide of tin, which it holds in solution; this is an error, since as fine tints are produced with pure nitric acid alone, as with the salt of tin.

The most important action of the brightening process is as yet unknown; it is this:—whether this operation changes the nature of the coloring matter united with the mordant;—whether the excess is thereby carried off;—or, lastly,—whether a brown substance, which tarnishes the coloring matter, is thereby detached. We think that this latter hypothesis is the most likely to be the right one, for when attempts have been made to saturate alumina mordants by dyeing only, without surcharging them with coloring matter, in order to avoid the second hypothesis, only a brick-red has been produced; although the attempt has been made in two ways, by employing for some experiments a low temperature, and for others a small quantity of madder. This brown tint in madder-dyed reds, is perhaps produced by tannin or gallic acid; this supposition is induced by the fact, that alumina mordants galled before dyeing are even much more brown than those dyed several times in madder only.

Alumina mordants are sometimes brightened with a mixture of alum and cream of tartar, which would seem to favor our second hypothesis, if those salts could not act also by taking up the mordant itself, or precipitating the tannin and gallic acid.

We have, in favor of the second hypothesis, the yellow tint which the coloring matter acquires under the influence of nitric acid, and which is converted into a fine red by the action of the soap; it is to be regretted that fine colors cannot be produced from the madder by employing alum only, without having recourse to nitric acid. The beauty of these colors does not arise

from the acidity of this salt, to which it might be attributed, as the brightening by means of sulphuric acid never produces such fine reds as by nitric acid.

The brightening process must effect some change in the molecular arrangement of the coloring matter, as it is so entirely detached, that it again produces stains upon the white parts, which stains are not removed without great difficulty, unless they are soaped immediately.

It is to be remarked, that when, after having brightened and soaped the maddered pieces, it is desired again to operate upon them in order to soften down the shades and render them lighter, very strong brightening solutions are requisite: it appears that the coloring matters acquire great fixity by the process of brightening. This fact is only explained by a change taking place in the nature of the coloring matter, and analogous, no doubt, to that of certain salts which abandon the last traces of their acid or base with greater difficulty, in proportion to the presence of a larger quantity of base or acid.

This phenomenon might also be owing to a triple combination of coloring matter, alumina, and fatty matter (of the soap), which would not take place until after the brightening process. What confirms this latter opinion is, that mordants in general, and especially those of alumina, after being soaped, cannot be again dyed, as they will not take up any more coloring matter;—the mordant appears to be completely saturated.

When designs containing two reds—the lighter over the deeper one—are brightened too much, the former alone remains, and the latter disappears, because the more base the alumina mordants contain, the less affinity they have for the fabric.

Iron mordants must be brightened with the same precautions as those of alumina; it causes them to assume a yellowish brown tint; they must then be washed in running water, and immersed in an alkaline-bath of hypochlorite of potash. The action is instantaneous, and owing to the excess of alkali, of which I assured myself. This is another point to be cleared up in the history of the coloring matter of madder.

Mordants of iron, brightened and washed, (but not soaped) and then maddered, are perfectly fast, if the action of the acid has not been carried too far,—for in that case, not only is the coloring matter destroyed, but the mordant itself carried off; thus rendering a combination of that and the coloring matter impossible. This fact proves that the brightening process acts upon the mordant as well as the coloring matter. Iron mordants, like those of alumina, are the more easily attacked by acids, as they are more powerful in their action. Immediately after the brightening process, the pieces, whatever may be their mordant, are soaped, and then finished, and folded for the market.

We have not made any remark with regard to the numerous varieties of shade observed in the pieces at different periods of

the year, although treated in the same manner; they may be occasioned by such a variety of circumstances, that one is at a loss to what to attribute them. For example,—after having produced very fine pinks, only dull ones can be obtained; splendid violets only furnish greyish colors; this is frequently the case, and happens from one day to another. The cause cannot be ascertained with certainty; but it is probable that by profound study of the coloring matter of madder, and especially of its manner of acting, with respect to the numerous heterogeneous matters which may be found in the water, most of them will be explained.

It would be very desirable, for the same purpose, to note down every day, the atmospheric changes, the nature of the water, and other casualties during the process.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 373, Vol. XXVII.)

"Description of the 'Great Britain' iron steam ship; with an Account of the Trial Voyages." By Thomas Richard Guppy, Assoc. Inst. C. E.

The Great Western Steam Ship Company originated with a few directors and proprietors in the Great Western Railway Company, who entertained the idea, that on the completion of the railway from London to Bristol, a direct line of communication, by means of steam-boats, to New York, as the focal point of the New World, might be established with advantage.

Hitherto, attention had been directed to the South-western harbours of Ireland, and the nearest ports in America, as the extreme distance between which, steam-boats of the greatest power then supposed to be practicable, would be enabled to carry a sufficient quantity of coal for the voyage; but this company, placing confidence in the opinion of Mr. I. K. Brunel (their engineer), ventured to build the 'Great Western,' a steamer exceeding in size any that had previously been constructed, and with engines of so much greater power, that the predictions of many experienced and scientific men were unfavorable to the project.

The 'Great Western' did, however, fulfil the expectations entertained of her by her projectors, in all respects, except in that, like many other moderate sized steam vessels, so large a part was occupied by the machinery, relatively to that which could be appropriated to passengers and goods, the deficiency of space was soon found to operate disadvantageously, in a pecuniary point of view.

At first it was intended that their second ship should be of timber, but the superior advantage which the introduction of iron appeared to hold out, induced a very careful comparison, and an investigation into the state of some small steam vessels already constructed of this material, and the result was the abandonment of the previous resolution.

As no example of an iron steam ship of sufficient size existed, on which to base any calculation of the thickness of the iron to be employed in its construction, or of the disposition of the material, in order to obtain the greatest relative degree of strength, much consideration was requisite, and it became necessary to organize an establishment for building iron instead of wooden ships, before the keel of the new vessel was laid.

The principal dimensions of the hull of the 'Great Britain' are—

	Ft.	In.
Length of keel................	289	0
Length aloft..................	322	0
Main breadth..................	50	6
Depth of hold.................	32	6

The tonnage, according to the usual mode of builders' measurement is, therefore, 3,444 tons.

The weight of iron used in the hull, is about 1040 tons; which is equal to an average thickness of $2\frac{1}{4}$ inches.

The weight of the wood-work in the decks, fittings, &c., is about 370 tons.

And the weight of the engines and boilers, (exclusive of the water), is 520 tons.

The total weight, therefore, is 1,930 tons; which, at a draft of water of 10 feet 6 inches forward, and 13 feet 7 inches aft, corresponds exactly with the calculation of the displacement of the hull, which is as follows :—

Draft.	Fore Body.	After Body.	Total.
Feet.	Tons.	Tons.	Tons.
12	1053	851	1904
14	1315	1099	2414
16	1594	1386	2980
18	1904	1714	3618

She will, therefore, be able to take 1000 tons of coal, and 1000 tons of measurement goods, weighing perhaps 400 tons, at a draft of 17 feet forward, and 17 feet 6 inches aft.

The keel-plate, consists of plates $\frac{7}{8}$ths of an inch in thickness, by 20 inches wide, which were welded into lengths of 50 feet to 60 feet, and these lengths were joined together, by very accu-

rately made scarphs, 1 foot 6 inches in length, and riveted all over, at distances of $4\frac{1}{2}$ inches apart.

The end pieces of the keel, which are more liable to touch the ground, are full 1 inch in thickness.

The stem is 12 inches deep at the forefoot, by 5 inches thick, and at the 8 feet water mark, it is 16 inches by $2\frac{1}{2}$ inches; thence it diminishes gradually to 12 inches by $1\frac{1}{2}$ inch. It is welded in one piece 18 feet long.

The ribs or frame are formed principally of angle iron, 6 inches by $3\frac{1}{2}$ inches by $\frac{5}{8}$th inch, at distances of 18 inches from centre to centre, but inclining gradually to 24 inches at the extremities, where also angle iron, 6 inches by $2\frac{1}{2}$ inches, and 4 inches by 3 inches is used.

In that part of the body of the ship which is occupied by the engines, the ribs are doubled, by having a similar angle iron riveted to them, with the web inside, or as it is termed, "reversed."

The outside plating commences with plates, 6 feet to 6 feet 6 inches long, and 3 feet wide, by $^{1}\frac{1}{8}$ inch thick; of these plates there are four courses; these are followed by several courses of $\frac{5}{8}$ inch thick, which is the strength of the whole of the immersed part, up to the deep load water line.

Above that height the same thickness is preserved a-midships, but it is gradually reduced to $\frac{3}{8}$ inch thick quite high up, and at the extremities, with a view to lighten them.

The longitudinal floor sleepers are ten in number; they are 3 feet 3 inches in depth, and $\frac{1}{2}$ inch and $\frac{7}{16}$ inch thick.

The middle sleepers extend throughout the length of the vessel; those on the sides are level on their upper surface, and consequently are terminated by the rising of the bottom of the ship.

These sleepers are tied to the bottom and are preserved in their vertical position, by inverted curves of strong angle iron, which are riveted to the ribs and also up their sides.

Along the upper edge of each, there is an angle iron, and over the whole is riveted an iron deck ^{8} inch in thickness.

There are two bilge keels, consisting of a middle plate $1\frac{1}{4}$ inch thick, and two angle irons, 5 inches each way by 1 inch thick.

These bilge keels are 110 feet long, and their under edges are on the same horizontal level with the under side of the keel, so that in docking the ship, if long baulks of timber are extended across the dock by way of blocks, the weight of the body of the ship (where the boilers and machinery are placed), is supported at given parallel distances on both sides of the keel,—all risk of straining it, or the machinery, is avoided, and the vessel is not obliged, in the usual manner, to rest upon her keel, until the bilge shores can be got under.

The upper cargo deck forward is made of plate iron, $\frac{5}{16}$ inch thick in the middle, and $\frac{9}{16}$ inch round the sides; it is riveted

together throughout, as well as to the iron deck beams, and to the sides of the vessel.

The main deck is made of pine timber 5 inches thick, and the planks are cross bolted at distances of 4 feet apart.

As this deck is situated on the load flotation plane of the vessel, where transverse stiffness is of more importance than longitudinal strength, the planks are placed athwartships, and their extremities are firmly bolted down, through two longitudinal stringers of Baltic timber, to the shelf plates, which are 3 feet wide by $\frac{5}{8}$ inch thick, and are very securely fixed to the sides.

The middle or promenade deck is also of pine timber 4 inches thick, placed lengthwise of the ship; it has also strong iron shelf plates 3 feet wide by $\frac{1}{2}$ inch thick, and Baltic stringers to attach it to the sides of the ship.

The upper deck is of red pine timber, and is also placed lengthwise. As the sides of the vessel at this height, and also this deck, may be considered as the truss, which is to resist longitudinal deflection, or drooping of the extremities, the outside plates are there $\frac{1}{2}$ inch thick, and they have been strengthened by an outside moulding-iron strap, 6 inches by 1 inch, and by additional straps of iron 7 inches by 1 inch, welded into lengths of 660 feet, and riveted to the inner sides of the upper line of plates.

The shelf plate of the deck is 3 feet wide by $\frac{1}{2}$ inch thick, and upon this, outside of the water-way plank, which is $4\frac{1}{2}$ inches thick, there is a course or tie of Baltic pine timber 340 inches in section, carefully scarphed and securely bolted to the ribs, and to the shelf plate, throughout the length of the ship. There are three rows of timber pillars, or stauncheons, which are fixed to the bottom of the ship, passing up between longitudinal ties at each deck, and are secured to the upper one.

The beams of all these decks are made of angle iron, 6 inches by $3\frac{1}{2}$ inches by $\frac{1}{2}$ inch, and their ends are bent down, and riveted to the ribs on each side.

Upon them, the shelf plates before mentioned are riveted, and thus form a horizontal band 3 feet wide at each deck.

A crutch or strut is introduced at each end of nearly every deck beam, which is riveted to it and to the ribs at about 3 feet from the angle of junction.

One of the most important improvements which has recently been introduced in the construction of vessels (particularly those of iron), is the water-tight bulkhead; as in the greater number of cases, when an injury may be sustained in one compartment only, it may absolutely preserve a vessel from sinking; several instances of this have already occurred, and even where it may not suffice for this purpose, it at least separates the leaky and injured from the secure parts, and gives time either to attempt to stop the leak, or to make other preparations.

In iron vessels, these bulkheads can be rendered much more

effectual than in wooden ones, by their exact contact with the bottom and sides, while at the same time they form admirable ties and stiffeners.

In the 'Great Britain,' there are five such bulkheads.

The first separates the forecastle from the forward passengers' cabin and the hold, and as it is in the forepart of a vessel that injury is most likely to be sustained, this partition is made particularly strong and secure.

The next bulkhead divides the forward cabin from the engine-room, or, more properly, from the fore-hold, for the coal and the stokers, at the forward end of the boilers.

The third bulkhead is abaft the engine-room, but in this, there is necessarily a hole for the screw-shaft to pass through; this is secured by a well fitted collar, and there is also a door, which is so arranged as to be shut and bolted quickly.

These three bulkheads pass up to the upper deck; there are also two others; one separating the after coal-hold from the after cargo-hold, and another nearly at the stern; both these terminate under the saloon deck.

At an early stage, in the construction of the 'Great Britain,' but not until her sides had assumed the form adapted for paddle wheels, the small steamer 'Archimedes,' belonging to the Company owning the patent of Mr. F. P. Smith for the application of the Archimedean screw, visited Bristol, and amongst other parties invited to make an excursion to the Holmes, on board of her, were some of the Directors of the Great Western Steam Ship Company.

The performance of the screw on that occasion, induced the author to request permission of Mr. Smith and Captain E. Chappell, R.N., who was officially appointed by the Admiralty to report upon her, to proceed in her to Liverpool.

On the passage, enough rough weather was encountered, to show that the screw possessed several good points, and was not so absolutely impracticable as had been asserted; and although far from venturing to give a decided opinion, on the author's return, he wrote such a letter to the Board of Directors, as induced them, after some days of deliberation, to decide upon suspending during three months the progress of the machinery for paddles, and also of that part of the vessel which might be affected by the change, and to call upon Mr. Brunel during that period to investigate the subject.

At the end of the proposed delay, the report which Mr. Brunel made, was so favourable, that, undaunted by the novelty and vastness of the experiment, the Directors resolved to adopt this mode of propulsion, of the success of which they have now such cause of congratulation.

From that period, until it became necessary to decide on the exact form of screw to be used, all possible means were taken, by

experiment and observation, to arrive at the best shape and angle of inclination of the blades, or, as it is commonly called, "the pitch."

Amongst others, the proprietors of Mr. Smith's patent liberally lent the Archimedes to the Great Western Steam Ship Company, for a period of several months, which afforded ample opportunity of trying the performances of the several forms of screws recorded in the following table:—

Number of Experiment.	Strokes of Engines per Minute.	Horse Power by Indicator.	Speed of Vessel in Knots.	Speed of Screw in Knots.	Ratio of Speed of Vessel to 1· of Screw.		Diameter of Screw. Ft.	In.	Pitch. Ft.	In.
1	25·41	67·1	8·375	10·646	·787	Smith's two half threads made of wrought iron.	5	9	8	0
2	20·75	53·7	8·16	10·88	·75	Ditto, ditto . .	5	9	10	0
3	26·25	68·59	7·55	8·23	·917	Ditto, made of cast iron	7	0	6	0
4	20·5	57·13	7·42	8·52	·87	Ditto, ditto . .	7	0	8	0
5	20·	57·3	8·175	8.	1·02	Woodcroft's increasing pitch, 3 blades, made of cast iron, as first made.	7	0	7	$7\frac{7}{8}$
6	21·5	62·6	8·1	8·1	1·	The same, with 3 inches cut off the termination of the blades.	7	0	7	$2\frac{1}{8}$
7	22·5	62·12	8·2	8·73	·94	The same, with 4 inches cut off the entering edge of the blades.	7	0	7	5
8	20·5	51·4	7·49	8·566		4 wrought iron arms, with blades, each 2 ft. 9 in. long by 1 ft. broad.	7	0	8	0

These experiments were made in the Bristol Channel under circumstances of weather, as nearly as possible similar, and the distances were very carefully measured by two of Massey's Logs, whose accuracy had been previously tested.

It will be observed, that the greatest velocity of vessel, 8·375 knots, was attained by Mr. Smith's screw of 5 feet 9 inches diameter, the angle of which was $19\frac{3}{4}$ degrees, and the slip was 21 per cent.; that is, the ratio of speed of the vessel to that of the screw, was as ·787 to 1.

Particular attention is due to experiments Nos. 5, 6, and 7.

Reasoning upon the assumption, that the effort of the entering edge of each blade, must cause the water to recede, and that each succeeding portion of blade should so increase in pitch, as to impinge with uniform force against the water, which was so receding, a screw of this description was made and tried before it was discovered that it was the subject of a patent by Mr. Woodcroft.

The first trial served to show, that the curvature or increase of pitch, which had been given to it, was too great, since the speed of the vessel was greater by 2 per cent., than that due to the mean pitch of the screw, whence it was evident, that the entering edge was really retarding, and the terminating portion alone was doing the duty.

On the second trial, when a radial strip 3 inches in width had been cut off the after part of each blade, the speed of the vessel was exactly that due to the screw; whence it was also evident, that the front edge still did not assist.

On the third trial, after a second radial slip of 4 inches had been cut off the entering edge of each blade, the vessel attained a speed of 8·2 knots, and the ratio of speed of the vessel was as ·94 to 1 of the screw.

The horse power employed on this trial, was by indicator, 62·12, and the speed of the vessel 8·2 knots, against 67·1 in the before-named trial, with the original screw of the Archimedes, when the speed she attained was 8·375 knots.

Although on neither of the trials numbered 5, 6, and 7, with this screw, was so great a speed of vessel attained, as on that first named, it is important to draw attention to the fact, that the slip was reduced to a very small quantity.

But the horse power exerted was also much less than in the first trial, arising from some imperfections in the cutting down of the screw and other causes which would probably have been remedied, had there been time to cast a new screw of this description; but unfortunately, just at this period, the Propeller Company required the Archimedes for service, and the experiments ceased.

This screw was afterwards tried by Mr. Barnes in the 'Napoleon,' a very beautiful French Post-Office vessel, built by M. Normand, of Havre, when the following result was obtained:—

Horse Power exerted.	Speed of Vessel in Knots.	Speed of Screw.	Speed of Vessel to 1· of Screw.
95·5	10·15	11·2	·895 = $10\frac{1}{2}$ per cent.

In the two cuttings down, this-cast iron screw with three blades 9 feet in diameter, which was originally very slight, had been so much reduced in substance, that it weighed only 833lbs. Mr. Barnes, therefore, could not venture to permit the engines to exert their full power, otherwise it is probable that a higher speed would have been attained.

The commencing angle is 70°, and the terminating one $19\frac{1}{2}^{\circ}$; the increase of pitch is therefore 1-12th, or $8\frac{1}{2}$ per cent.

The screw of the 'Great Britain,' which is of wrought iron consists of six arms, formed by placing and riveting together, distinct forgings, or centre pieces, with arms welded to , each of which is 6 inches thick.

Upon the extremities of these are riveted palms of plate iron, which are 4 feet 4½ inches long on their circumferential edge, by 2 feet 9 inches in height, and ⅝ inch thick.

The diameter is 15 feet 6 inches, and the pitch or helix of one revolution is 25 feet, which equals an angle of 28 degrees.

Its weight is 77 cwt.

The area of the six palms, which may be considered as the effective part of the screw, is 56·25 feet; but the area, calculated as a plane perpendicular to the axis, that is, as portions of a disc, is only 47·4 feet, and the portions of the arms within the blades present a similar area of 26·88 feet.

As the rotary velocity of the outer edge of the blades is nearly 30 miles an hour, it is important, in order to diminish friction, they should be as accurately shaped as possible, and should present no irregularities of surface. In this instance, the object was attained, by mounting the screw on a face plate and planing the surface, by means of a tool, to which the proper motion was given; after which it was painted several times, rubbed very smooth, and varnished.

On the second trial of the 'Great Britain,' on the 20th January, in the Bristol Channel, in smooth water and during a calm, the engines attained the speed of 18⅔ strokes per minute, when the speed of the vessel through the water, measured by an experienced seaman, with the common log, was 12⅓ knots.

$$
\begin{array}{ll}
 & \text{Feet.} \\
18{\cdot}66 \times 2{\cdot}948 \times 25 = & 1375{\cdot}242 \text{ velocity of the screw.} \\
12\tfrac{1}{3} \text{ knots} \times 101{\cdot}2 = & 1247{\cdot}796 \\
\hline
 & 127{\cdot}446 \text{ slip,—}
\end{array}
$$

thus, the speed of the vessel was ·907 to 1· of the screw.

The area of the midship section of the ship, at the time of this experiment, was 480 feet.

The steam-engine employed to drive this screw consists of four steam cylinders, each of 88 inches in diameter, by 6 feet stroke, into which steam is admitted by piston valves of 20 inches in diameter.

As it is very troublesome to lift large cylinder covers, manholes are made in them, and in the piston, so that the bottoms of the cylinders can be easily examined.

The large diameter given to the steam cylinders was purposely with a view to working very expansively, and on the trial recorded the steam, being at 4 lbs. pressure in the boiler, was throttled on its passage and cut off by the expansion valve at 1-6th of the stroke, that is, 1 foot from its commencement.

The connecting rods of these engines are applied in pairs to crank pins, at either end of the main shaft, and the same crank

pin carries the connecting rod of one air-pump of the same length of stroke by 45½ inches in diameter.

This air-pump is inserted in the wrought iron condenser, which receives the steam from the cylinders.

The main shaft is of wrought iron, 17 feet long by 28 inches in diameter, in the centre, and 24 inches in the bearings, which are 30 inches long; through this shaft, as through the cranks and crank pins, a hole is bored and a stream of cold water is constantly injected, which has an important influence in keeping the bearings cool.

Upon this main shaft, is a toothed drum, of 18 feet in diameter, with a face 38 inches in width, around which, and a lesser drum of 6 feet in diameter, placed below it, four sets of pitched chains work; the motion of which is remarkably smooth and noiseless. Each set of these chains consists of two links and three links alternately: the sectional area of the four sets is 24 inches.

The best method of giving the requisite speed to the screw shaft, was long under consideration, and the usual means, by gearing, straps, &c., were not overlooked; but each appeared to have some objectionable quality; at length Mr. Brunel suggested the pitched chain, which was finally adopted.

These links were very carefully forged, they were then brought to a dull red heat and placed in a proving machine, where they were stretched one-eighth of an inch, and while in that state they were rigidly examined. After boring and planing, they were all finished on one gauging tool and case-hardened.

As the engines are intended to work at 18 revolutions per minute, and the speed is got up at the rate of nearly 2·95 to 1, the screw will then make about 53 revolutions per minute.

The lower shaft, to which the screw is attached, consists of three lengths. On the first, which is 28 feet 3 inches long, by 16 inches in diameter in the journals, is fixed the lesser drum, which is 6 feet in diameter, and at the forward end of this, is the step, which resists the thrust, or effort of the screw, which will be presently described.

The second piece is a hollow wrought iron shaft, 61 feet 8 inches long and 30 inches in diameter, formed of two courses of plates each ¾ inch thick, riveted together by countersunk rivets 1⅛ inch in diameter.

The third piece is 25 feet 6 inches long, and as the screw has no bearing at its outer end, it is 17 inches in diameter in the journal, just within the stern-post.

The shaft does not rest in the stern-post, but in another bearing, outside of it, and the water is kept out by a packing, composed of eather and copper.

The thrust, or effort of the screw, is received by a step, composed of a steel plate 2 feet in diameter, against which a gun-metal plate, of similar diameter, affixed to the heel of the shaft,

presses. A stream of water is admitted to a cavity, in the centre of these plates, and very satisfactorily lubricates them.

The cast-iron box of this step is very firmly attached to the frames of the engines, and in fact to the body of the ship, by wrought-iron trussing.

The boiler consists of one outside case 34 feet long, by 31 feet wide, and 21 feet 8 inches high, and this is divided into three distinct boilers, by means of two longitudinal partitions.

They have an apparatus for regulating the discharge of brine, and also a hot-water jacket, around the lower part of the funnel, into which the feed water is pumped, and whence it flows into the boilers.

In each boiler there are four furnaces at the after, and four at the forward end; therefore, there are twenty-four fires in the whole. Each furnace has its own distinct course of flues, terminating in one take-up in the middle.

The total area of the surface of the grate-bars is 360 square feet.

The total area of furnace surface, exposed to the direct action of the fire, is 1248 square feet, and the total areas of the flues are,—

Of upper surface . . .	1608 square feet.
Of side surface . . .	6504 ,,
Of bottom surface . .	1740 ,,

When the form of the engines was first decided on, it was intended that the cylinders should be 80 inches in diameter; but they were afterwards increased to 88 inches, with the view of working the steam very expansively, and thus obtaining an increase of power at a reduced expenditure of fuel.

As far as can be at present judged, this appears to have succeeded, but in consequence of the rough weather on the voyage round, it was not possible to weigh the coal consumed.

When the 'Great Britain' was commenced, the city of Bristol had taken up the subject of widening the dock-gates of the port, with other improvements, so warmly, that no doubt was entertained that, before she should be completed, there would be no difficulty in her going out; accordingly she was designed 5 feet 6 inches wider than the existing locks.

Various causes led to the abandonment, for a time, of these improvements, and the ship, when ready for sea, was not only discovered to be a prisoner, but likely to continue so, in consequence of the personal liability which it was assumed the Dock Company might incur, if, by permitting any disturbance of their works, not provided for by Act of Parliament, any injurious consequences should ensue to the port.

This state of affairs lasted for several months, until at length by an agreement between the two companies, permission was accorded to remove, first so much of the masonry and gates,

would allow the ship to pass from the floating harbour into the outer basin; next to restore these, and then to adopt the same course, with the gates and one side of the lock, communicating with the river Avon.

This was accomplished, and the ship hauled out, on the evening of the 11th December, and at 8 o'clock on the following morning, she was towed down the river Avon to Kingroad: the boilers were filled in the progress, the steam was raised, and a trip of a few hours' duration was made,—the greatest speed then attained being—

Strokes of the Engine.	Multiplication of the Chain gearing.	Pitch of Propeller.	Feet.	
16¼	2·948	25 feet =	1197·25	Velocity of Propeller through the water.
Speed of the Ship . .		11 knots =	1115·15	
			82·10	Slip, or as ·93 to 1·

The next trial was on the 8th January, when a numerous party of proprietors, and several engineers and scientific men were on board; but unfortunately the fog was so dense, that after waiting at anchor for several hours, the pilot, apprehensive of losing sight of the land, reluctantly consented to go a short distance, merely to gratify the visitors. On this occasion the greatest speed of the engines was 18¼ strokes, the speed of the ship was 11¼ knots, and the slip was 13 per cent.

On the 20th January a run was taken down the Bristol Channel, nearly to Ilfracombe and back, a distance of 95 knots, without much wind, but in a head swell, and with a balance of about two hours of tide against the ship. This distance was performed in 8 hours 34 minutes, or at an average rate of upwards of 11 knots.

The greatest rate of the engines was 18¾ strokes per minute, the steam pressure being 2¼ lbs., and the vacuum 26 inches, and cutting off at 18 inches of the stroke; when the ship's speed was 12⅛ knots, the slip of the screw being 9⅝ per cent.

Finally the 'Great Britain' quitted the port of Bristol for London on the evening of 23rd January.

The masses of cloud which had traversed the sky during the day, and the occasional heavy gusts of wind, indicated the coming of the gale, which was shortly after experienced.

During this voyage the engines made 52,773 strokes, consequently the distance described by the screw was 639 knots, and the actual distance traversed by the ship, as computed by Captain Hosken, was 567 knots. The ratio of the speed of the ship, to that of the screw, during the entire voyage, was as ·887 to 1·; or in other terms, the total slip was 12¼ per cent. Considering then, that during the first 20 hours there was a strong gale and a head sea, and also, that in the run from the Downs to Black-

wall, there was an exceedingly stiff head gale, while in the intermediate part of the voyage, the wind was so light as to be of little service, this may be accounted an exceedingly favourable result.

The balance of tides was also considerably adverse.

The time the ship was under weigh, was 59½ hours, so that the average speed was upwards of 9½ knots, and if allowance be made for times when, on account of the bearings becoming warm, the engines went slowly, the average speed may be fairly reckoned at 10 knots per hour.

Owing to the inefficiency of the stokers, the steam was not regularly, or well kept up, and the pressure varied from 2 lbs. to 5 lbs., being frequently low. Duffryn coal was used, and all the ashes were burned. The throttle valves were kept more than one-half closed, and the expansion valves cut off the steam at one-sixth of the stroke, so that the economy of the fuel must have been very considerable; but the men were too feeble to weigh the coal, and the arrangement of the indicators was not so far completed as to enable cards to be taken.

This account would not be complete, without some explanation of the state of the ship, when she encountered the gale on Friday the 24th. The crew of sailors consisted chiefly of that indifferent class usually shipped for short runs, to whom of course the rig of the ship was perfectly new. Some of the engineers stood well to their duty, but others, and nearly all the stokers, were completely knocked up with sea-sickness. The deck was encumbered with at least 30 tons to 40 tons of chain cables and materials; and the coal was stowed chiefly in the upper bunkers for the greater convenience of working it with so few men.

Consequently, with no weight in her bottom, the centre of gravity was raised so high, that the rolling, which was considerable, but very easy, is not surprising.

With the wind a-head, or on either bow, and with a heavy head sea, she steered with the geatest ease and precision, and in the crowded river it was truly surprising how she threaded her away.

When the heavy sea before mentioned struck her, it caused no deviation whatever from the uniform motion of the engines, which went on as steadily as if they had been on land, neither was there the slightest yielding in the plummer-blocks, the frame, or in any part of the engines, or the engine-room, which is so rivetted together, as to form one united frame.

On several occasions the author watched the screw, and he does not think it ever arose one-half of its diameter out of the water, and standing by the engines during the worst of the gale, he could only observe that there was occasionally a slight acceleration, during perhaps half a revolution, but there never was any check to the uniform rate.

The paper is illustrated by seven drawings and diagrams, Nos.

3778 to 3784, showing longitudinal and transverse sections of the vessel and engines, with an elevation of the screw-propeller and diagrams of its angles of pitch, slip, &c.

Mr. Barnes confirmed the general statement of the results of the trial of the screw, which was lent to the 'Napoleon,' the information having been, in fact, communicated by him to Mr. Guppy, immediately after trying the experiments. One point only required correction. The reason for the whole pressure of the steam not being applied, was not from a fear of breaking the screw, but because of its small dimensions; it having been made for the 'Archimedes,' whose engines were 80 or 90 H.P., and more particularly, on account of the pitch being so small. The result was, that when it was applied on board the 'Napoleon' the engines (which were 130 H. P.) would have required to have been driven at such an increased number of strokes, that the boilers could not have supplied sufficient steam. Even with the throttle-valve partially closed, great attention was required, to keep up a steady speed.

He thought the results obtained, with such a small propeller, quite extraordinary, and such as could not have been anticipated.

Mr. T. R. Guppy stated, in answer to questions from the President and Members, that during the whole voyage the throttle-valve was only one-third open, and that the steam was cut off at one-sixth of the stroke. It was not possible to take any accurate account of the coals consumed, but he estimated the consumption at about 40 tons in 24 hours. The screw propeller of the 'Great Britain' was too small, but still the speed obtained, even against a heavy head sea, was never below 5½ knots per hour.

Captain Hosken said, he considered it necessary to reduce the speed in heavy weather; it was in such cases dangerous to apply all the power of the engines; there was a danger of the sea making a clear breach over the vessel, if she was driven bodily forward, instead of being allowed to rise with the waves. The experience he had acquired in the 'Great Western,' had clearly proved the correctness of his views.

His opinion of the advantage of the screw as a mode of propulsion was decided, and he thought, that it would, for sea-going vessels, supersede paddle-wheels. During the worst part of the voyage, with the 'Great Britain,' the screw was never more than one-half of its diameter out of the water, and the other half was acting efficiently at the same time; whereas, under similar circumstances, with such a cross sea, the leeward paddle-wheel would have been immersed, probably above its shaft, while the windward wheel would have been completely out of the water; the strain upon the engines, in such a case, was very prejudicial; but in the 'Great Britain,' he never noticed any variation in the

working of the engines, not even when she was struck with the heavy sea, which had injured the bow.

Captain Sir Charles Napier inquired, whether the 'Great Britain' steered well, and whether it was not found she had a tendency to fall off to leeward in a cross sea? He should have supposed, that the action of the screw propeller being so entirely in the stern, it would act upon the ship like sculling a boat.

Captain Hosken replied, that the 'Great Britain' steered extremely well; and that there was not any tendency to fall off to leeward.

The action of the screw could not be correctly compared with that of a scull upon a boat; in that case, the power acted entirely upon the stern; but with the screw, the power was exerted in the direction of the shaft, up to the engines, in the centre of the ship, and by a simple arrangement, it could be carried on even up to the bow. He was of opinion, that the leeward paddle-wheel had not much power to keep a vessel up to the wind; it was so close to the ship's side, that its leverage was not considerable.

Sir Charles Napier thought, the principal danger of the screw propeller, was in running before the wind, in a heavy sea. If struck by a heavy wave, the sternpost and the propeller might be carried away together; as also in case of getting on shore, the screw would not be so efficient in clawing off shore, as the paddle-wheels would be.

Captain Hosken said it was evident, that the propeller was not easily injured, for since his arrival in the Thames he had found, coiled round the shaft, nearly 9 fathoms of chain cable, which had been apparently torn away from the mooring of a buoy, in coming up the river.

Mr. J. Miller said, one point of importance in favour of the screw, was its not being affected by variations of immersion, arising either from the draught of water of the vessel, or from the rolling in a heavy sea. He had noticed particularly, the difference of the speed of the engines, on board the Royal Mail Company's vessels, at the commencement and at the end of a voyage. At starting, with a full compliment of fuel, the paddle-wheels were plunged so deep, that the speed of the engines, which ought on an average to be 17 strokes per minute, was reduced to 8 or 9 strokes, and at the end of the voyage, the paddle floats had scarcely sufficient hold on the water. A vessel with a screw propeller would not be so affected.

He thought also, that the screw was less liable than paddle-wheels to be injured by heavy seas.

Captain Hosken was anxious to record clearly, the points where he was satisfied the propeller was preferable to the paddle-wheel, for steamers generally, but more particularly for the purposes of war and for Atlantic navigation.

By using the screw, a great weight was entirely removed from the top sides and centre of the ship.

The exertion of the power of the engines was transferred from the top sides and centre to the lower midship body, which was the strongest part of the ship.

There was a saving of nearly one-half the weight. In the instance of the 'Great Britain,' that ship was first intended for paddle-wheels, which with all the appurtenances of beams, boxes, shafts, &c., were estimated at 180 tons. The weight of the propeller, the chain-wheels, shaft, chain, &c., might be taken at about 80 tons, and that weight was dispersed over nearly half the ship's length. When leaving port and the ship was deep, the propeller would exert its greatest power, when it was most required; paddle-wheels, on the contrary, when deeply immersed, would not allow the engines to exert their power.

A steam-ship, with a propeller, answered the helm quicker, and steered easier, than a paddle-wheel ship.

A great point also, was the superior efficiency of a screw-propeller ship under canvas, on account of the absence of the unsightly and detrimental paddle-boxes; possessing also the advantage of the sails acting with the engines, instead of injuriously to them, as with paddle-wheels. When the sails took effect, the ship heeled, or inclined to one side, the paddle-wheels consequently became too deeply immersed on one side, and had not sufficient hold upon the water on the other, manifestly wasting the power of the engines.

The screw-propeller was more easily disconnected from the engines than the paddle-wheels, should it be required to save fuel, or if the engines were disabled,—and the ship being properly rigged, a decidedly efficient sailing ship still remained, which in a paddle-wheel ship was not possible.

The screw propeller was less liable to be damaged by heavy seas, or by shot, than paddle-wheels. Very recently, the West India Royal Mail Steam-packet 'Dee,' had one wheel quite disabled by a heavy sea striking it, while the screw was nearly always so immersed as to be out of the reach of injury, either from waves or shot.

As the relative merits of screw-propellers and paddle-wheels were of national importance, Captain Hosken felt confident, no apology was necessary, for thus, as concisely as possible, giving his opinion before the Institution.

If he might recommend any points for the consideration of the Members, it would be, that they should exert their ingenuity to discover the best propeller, all circumstances being considered; as in his opinion, it would be very difficult, if not impossible, to find a propeller that should be the best under every variety of circumstance. He considered the best method would be, to

multiply or reduce the speed of the propeller, as might be found necessary, under different circumstances, but that, he was aware would, in very large steamers, be difficult of attainment.

Sir Charles Napier agreed with Mr. Miller, with regard to the disadvantages of the deep immersion of the paddles, particularly those of war steamers, where wheels were constantly plunged too deeply when they had their full armament and fuel on board. For fifteen years past, he had urged upon the Government the necessity of paying more attention to the construction of their war steamers; for in his opinion, there was not one really good steamer in the service, and he thought the 'Retribution,' which was the last vessel finished, was not any improvement upon its predecessors. He objected particularly to the present construction of direct-acting engines, by which the working parts were exposed to injury from shot. He thought, that all the upper parts of the engines, and the naves of the paddle-wheels, should be made of wrought iron, as in the case of being struck by shot, less serious injury would ensue, than when they were made of cast iron.

He would suggest also, whether it would not be possible to have tanks near the paddle-boxes, to be filled with water as the fuel was reduced in weight, and thus to keep the vessel at an uniform draught, so that the power of the engines could be always advantageously employed.

Captain Hosken said, in reference to the points suggested by Sir Charles Napier, experience had shown that any thing cumbersome about paddle-wheels was bad for sea purposes; any machinery about them was difficult to be kept in order, and if the paddle-wheels were made to reef, when they were exposed to a heavy gale or sea, they would assuredly lose a large portion of their paddle-floats.

The suggestion of a contrivance to fill water about the paddle-boxes, in proportion to the fuel consumed, so as to keep an uniform dip of float-board, appeared not only objectionable, but it amounted almost to an impossibility. It was scarcely possible, even if desirable, to find space for 500 tons of water, in a steam ship, that might take that quantity of fuel as her sea stock, and doing so, would keep the ship in a long voyage continually groaning under a heavy burthen. He agreed with Sir Charles Napier, as to the desirableness of an uniform dip of the paddle-board, if it could be obtained, but if it was only to be arrived at by always carrying a heavy weight, it was better to continue the present plan, of starting deep and arriving light.

Mr. Guppy said, in answer to questions from members, that, at present, he believed the average speed obtained by vessels with screw-propellers, was below that of paddle-wheel steamers. A new screw of larger diameter and greater area of palms, was

being made for the 'Great Britain,' with a view to increasing the speed.

It should not be forgotten, in the discussion, that a distinctive feature of iron vessels, was their stiffness, and he conceived, they were better calculated to withstand the shock of heavy seas, than wooden vessels were.

Four chains, weighing together about 7 tons, were employed for communicating the power from the upper drum, upon the main shaft, to the lower drum upon the shaft of the propeller. They worked smoothly and without noise, and at present had not shown any tendency to wear, or to lengthen. From the form of the link, he conceived, that the chains would only lengthen on the slack side, under any circumstances, and this would not affect their working, as the projecting ends of the links would, on the driving side, always fall into the recesses prepared for them, so that these recesses must be much worn before the chains would ride out of their proper direction upon the drums.

Mr. R. Stephenson observed, that the chains very nearly resembled those used in the early locomotive engines, and which were discarded, on account of their lengthening so much, as to render them useless. It was true, that the links of the locomotive chains were much smaller, there were many more traversing pins, and the speed at which they travelled was probably greater than the large driving chains of the 'Great Britain,' which would, therefore, be less liable to injury than those he had mentioned.

LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

1845.

Nov. 26. *John Dent, William Dent, and Jeremiah Macklin Allcroft,* of the city of Worcester, and of 97, Wood-street, Cheapside, London, for a stud or fastening for gloves and other articles of dress.

28. *Callistus Augustus Godde de Liancourt,* of No. 16, South Audley-street, Grosvenor-square, and *Richard Childs,* of No. 18, Queen Ann-street, Cavendish-square, for the Parisian button.

29. *George Stacey,* of Uxbridge, Middlesex, for improvements in chaff-cutters, whereby the various lengths

Nov. 1. of hay, straw, and other fodder, are adjusted for cutting.

29. *George Ee Frere*, of Edinburgh, and *Benjamin Tucker Stratton*, of Bristol, for a lifting apparatus for clod-crushers, scarifiers, and such like implements.

Dec. 1. *Robert Spencely*, of Ely, for a double-action pump.

1. *George Macfarlane*, of No. 41, Gerrard-street, Soho, London, for a cornopean (cornet-à-piston), trumpet, French horn, trombone, and ophiclede.

3. *Joseph Rock Cooper*, of No. 24, Legge-street, Birmingham, for a percussion cap-holder.

5. *John Finning*, of No. 35, Collier-street, Pentonville, for an instrument for describing curves.

5. *Galt & Son*, of High-street, Portsmouth, for a wire-frame washing-stand.

8. *R. Garrett & Son*, of Leiston Works, Saxmundham, Suffolk, for an improved barley aveler or humelling machine.

9. *John Hawkins*, of Green-lane, Walsall, for an improved bit.

9. *Thomas Varty*, Educational Depository, York House, Strand, for the serial tablet-frame.

10. *Stephen Marlin*, of Leven, near Beverley, in the county of York, for an improved horse-hoe.

10. *James Lancaster*, of Birmingham, for a spectacle-frame.

11. *Tyler & Pace*, of Cornhill and Hackney, for a perforated metal shade.

15. *Charles Frederick Darwall*, of Walsall, for the cornubella.

16. *James Chesterman*, of Ecclesall New-road, and *John Bottom*, of No. 6, St. Phillip's-road, both of the town of Sheffield, for a case for tape-measures.

16. *William Godfrey Robinson*, of No. 13, Stuckley-terrace, Hampstead-road, for the vertical meter.

17. *Brookes Hugh Bullock*, of No. 2, Chester-street, Grosvenor-place, in the county of Middlesex, for a distance measurer, for maps, charts, &c.

18. *John Keyse*, of No. 27, Crosby-row, Walworth-road, for an improved swimming apparatus.

Dec. 19. *Draper & Hooker*, of Basingstoke, for an improved carriage.

20. *Richard Millard*, of No. 12, Craven-street, Strand, London, for a portable recumbent and easy chair.

20. *William Godfrey Robinson*, of No. 13, Stuckley-terrace, Hampstead-road, for the vertiaximmeter,—certain additions to the prismatic compass, for the purpose of combining with that instrument the principle of the vertical meter, by which vertical angles are approximately measured without the aid of a stand or artificial horizon.

22. *Boyd & Harmer*, of Spital-square, for a vapour-bath.

26. *James Gisborne*, of Suffolk-street, Birmingham, for improved wind-ways and valves for cornopeans and other valved instruments.

List of Disclaimers

OF PARTS OF INVENTIONS AND

Amendments

MADE UNDER LORD BROUGHAM'S ACT.

Disclaimer entered to part of the Title of Letters Patent, granted to Frederick Rosenborg, of Kingston-upon-Hull, gentleman, for certain improvements in machinery for cutting and shaping wood and other materials into various forms or figures, and also for cleaning and smoothing the surfaces of the same forms or figures; bearing date the 15th April, 1845,—filed the 19th November, 1845.

Disclaimer and memorandum of alteration entered by the Assignees of the Letters Patent, granted to John Frederick William Hempel, of Oranienburg, in the kingdom of Prussia, but then of Clapham, in the county of Surrey, officer of engineers, and Henry Blundell, in the county of York, paint and color manufacturer, for an improved method of operating upon certain vegetable and animal substances, in the process of manufacturing candles therefrom. Dated the 15th September, in the

seventh year of the reign of His late Majesty, King William the Fourth.—Filed 18th November, 1845.

Disclaimer entered by Edmund Morewood, late of Highgate, in the county of Middlesex, gentleman, but now of Steel-yard Wharf, in the city of London, Gent., to part of the Title and Specification of Letters Patent, granted to him for an improved mode of preserving iron and other metals from oxidation or rust; bearing date the 27th day of August, in the fifth year of the reign of Queen Victoria.—Filed 12th December, 1845.

List of Patents

Granted for SCOTLAND, subsequent to November 22nd, 1845.

To Robert Hazard, of Clifton, near Bristol, confectioner, for improvements in apparatus for heating public and private buildings.—Sealed 26th November.

Edward Augustus King, of Warwick-street, London, for improvements in obtaining light by electricity,—being a foreign communication.—Sealed 26th November.

Richard Archibald Brooman, of Fleet street, London, for certain improvements in weaving machinery,—being a foreign communication.—Sealed 26th November.

Henry Clark, of Red Cross-street, Cripplegate, London, oil-merchant, and George Roberts, of Wells-street, Cripplegate, miner, for certain improvements in the construction of lamps, and in the preparation of materials to be employed for producing illumination.—Sealed 1st December.

Richard Archibald Brooman, of Fleet-street, London, for certain improvements in dyeing,—being a foreign communication.—Sealed 1st December.

Henry Buckworth Powell, of Pennington-house, Southampton, for certain improvements in carriages to be used on rail and other roads.—Sealed 1st December.

William Corscaden Thompson, of Liverpool, master mariner, for certain improvements in machinery or apparatus for propelling vessels on water,—being a communication from abroad. —Sealed 2nd December.

William Johnson, of Farnworth, near Bolton, agent, for certain improvements in machinery or apparatus for preparing cotton and other fibrous substances for spinning.—Sealed 3rd December.

William Newton, of the Office for Patents, 66, Chancery-lane, London, civil engineer, for improvements in manufacturing types and other similar raised surfaces for printing,—being a foreign communication.—Sealed 3rd December.

Ernest Edge, of Manchester, mechanic, for certain improvements applicable to the wheels and axles of engines, tenders, carriages, and waggons, to be used upon railways.—Sealed 4th December.

Thomas Findler, of Glasgow, flint-miller, for a new invention or improvements in the construction and operation of certain parts of flint grinding mills, or machinery for grinding.—Sealed 4th December.

John Constable, merchant, of London, for improvements in the manufacture of gas for lighting and heating,—being a foreign communication.—Sealed 4th December.

Peter Spence, of Burgh, in the county of Cumberland, chemist, for improvements in the manufacture of copperas and alum.—Sealed 4th December.

Nathaniel Chappell, of Arcadian Villa, Cumberland-road, Bristol, for improvements in the manufacture of worts.—Sealed 4th December.

John Blyth, of Limehouse, in the county of Middlesex, engineer, for certain improvements for diminishing the risk of accidental explosions of gunpowder, and other substances which are liable to explode or ignite by contact with fire.—Sealed 5th December.

William Henson, of Skinner-street, St. John-street-road, London, civil engineer, for improvements in machinery for weaving.—Sealed 6th December.

James Bounsall, of Fleet-street, London, for certain improvements in the preparation of resin, and resinous-like substances, one or more, and certain new applications thereof to manufacturing purposes,—being a foreign communication.—Sealed 6th December.

Thomas Henry Russell, of Wednesbury, Staffordshire, tube manufacturer, for improvements in the manufacture of welded iron tubes.—Sealed 8th December.

Moses Poole, of London, gentleman, for improvements in the construction of vessels to contain liquids and substances, and in the means of impregnating liquids with gases, and in drawing off such liquids from such vessels, and in closing such vessels, —being a foreign communication.—Sealed 8th December.

Moses Poole, of London, gentleman, for improvements in filling bottles and other vessels, and also in covering, stopping, or securing liquids and other matters in bottles and other vessels, —being a foreign communication.—Sealed 8th December.

William Mushet and Robert Mushet, iron-founders, both of Dalkeith, Edinburgh, for improvements in moulding iron.—Sealed 9th December.

John Dearman Dunnicliff, of Nottingham, lace manufacturer, and William Bull Dexter, of the same place, lace-maker, for improvements in the manufacture of warp fabrics.—Sealed 9th December.

Samuel Childs, of Earl's Court-road, Kensington, candle manufacturer and wax chandler, for improvements in the manufacture of candles.—Sealed 10th December.

Wilton George Turner, of Gateshead, Durham, Doctor in Philosophy, for an improved mode of treating guano, for the purpose of obtaining chemical compounds therefrom.—Sealed 10th December.

William McNaught, of 26, Robertson-street, Glasgow, engineer, for certain improvements in the steam-engine.—Sealed 11th December.

Christopher Binks, of Friar's Goose House, in the county of Durham chemist, for certain improvements in manufacturing, and in the application of certain compounds of nitrogen, particularly cyanogen, ammonia, and their compounds, and in the application in such manufactures of a substance or substances not hitherto so employed.—Sealed 12th December.

Robert Kerr, of Thread-street, Paisley, manufacturer, for certain improvements in hand-loom weaving, and for producing a double fabric of raised figure-work in the same loom by one process, of weaving.—Sealed 12th December.

Samuel Cunliff Lister, of Manningham, near Bradford, manufacturer, for improvements in preparing and combing wool.—Sealed 15th December.

Henry Blumberg, of Camberwell-grove, Surrey, distiller, for improvements in the purification of spirits, for the use of brewing-distillers and rectifiers.—Sealed 16th December.

Thomas Clarke, of Hackney, London, engineer, and John Varley, of Poplar, London, engineer, for improvements in railways and other carriage-ways; in propelling, and in engines, carriages, and other machinery employed in propelling.—Sealed 17th December.

John Penn, of Greenwich, engineer and manufacturer of steam-engines, William Hartree the younger, of Greenwich, engineer, and John Matthew the younger, of Greenwich, engineer, for certain improvements in steam-engines, and machinery for propelling vessels, which improvements are also applicable for other purposes.—Sealed 18th December.

New Patents

SEALED IN ENGLAND.

1845.

To John White, of Salford, Lancashire, engineer, for certain improvements in engines, machinery, or apparatus for raising and forcing water. Sealed 27th November—6 months for inrolment.

Peter Spence, of Burgh, in the county of Cumberland, for improvements in the manufacture of copperas and alum. Sealed 27th November—6 months for inrolment.

Moses Poole, of Serle-street, Middlesex, Gent., for certain improvements to hinder the oxydation of iron in all its various states of cast metal, steel, malleable iron, and also to render malleable iron more hard and durable,—being a communication. Sealed 27th November—6 months for inrolment.

Eden Thomas Jones, of Bristol, manufacturing chemist, for improvements in the apparatus used in the concentration of sulphuric acid. Sealed 27th November—6 months for inrolment.

William Maugham, of Newport-street, Surrey, consulting chemist, and Archibald Dunlop, the younger, of Upper Thames-street, Gent., for improvements in the manufacture of ale, porter, and other fermented liquors. Sealed 27th November—6 months for inrolment.

Edward Dell, of Woolwich, wine-merchant, for certain improvements in apparatus for heating and warming. Sealed 4th December—6 months for inrolment.

Robert Rettie, of Glasgow, civil engineer, for an improved method of signalizing or telegraphing on sea or land, preventing collision at sea, and giving signals of distress, by improved burners, with glasses colored, and signal cards, applicable to railways in all the various departments, as well as preventing of accidents when the train is at full speed; shewing the state of the tide in harbours; also the diurnal for railways, towns, villages, &c. Sealed 4th December—6 months for inrolment.

William Gossage, of Neath, metallurgist, for improvements in obtaining products from certain ores, and other compounds of certain metals. Sealed 4th December—6 months for inrolrolment.

John Leslie, of Conduit-street, Hanover-square, tailor, for improvements in the combustion of gas. Sealed 4th December—6 months for inrolment.

Moses Poole, of Searle-street, London, Gent., for improvements in locks,—being a communication. Sealed 4th December—6 months for inrolment.

James Meacock, of Kingston, Jamaica, merchant, for improvements in pulping, dressing, and sorting coffee. Sealed 4th December—6 months for inrolment.

Archibald Dunlop, jun., of Thames-street, London, Gent., for improvements in the manufacture of aerated waters. Sealed 4th December—6 months for inrolment.

Henry Bessemer, of Baxter House, Old St. Pancras-road, Middlesex, engineer, for certain improvements in atmospheric propulsion, and in apparatus connected therewith; part or parts of which improvements are applicable to the manufacture of columns, pipes, and tubes; and other parts are applicable to the exhausting and impelling of air and other fluids generally. Sealed 5th December—6 months for inrolment.

John Robert Johnson, of Alfred-place, Blackfriars, chemist, for improvements in the materials employed in constructing and working atmospheric railways. Sealed 6th December—6 months for inrolment.

Henry Heathcote Russell, of Millbank-street, Westminster, civil engineer, for improvements in constructing suspension bridges and viaducts. Sealed 6th December—6 months for inrolment.

Josiah Wilkinson, of Lincoln's-inn-fields, Gent., for certain improvements in filtering water and other fluids,—being a communication. Sealed 8th December—6 months for inrolment.

Henri Auguste Bex, of Great Titchfield-street, St. Marylebone, architectural decorator, for a new method of polishing, dyeing, and coloring marble, stone, and certain other materials used in the construction or decoration of houses and other buildings. Sealed 10th December—6 months for inrolment.

Edward Green, of Wakefield, in the county of York, engineer, for a new method of economizing fuel; and certain improvements in retaining and applying heat for generating steam, and heating water. Sealed 10th December—6 months for inrolment.

Thomas Williams, of Norway-street, Middlesex, Gent., for a certain improvement or certain improvements in wrenches or spanners. Sealed 10th December—6 months for inrolment.

William Dimes, of Oldston, near Dartmouth, Devon, Esq., for improvements in the making and fixing of window glass. Sealed 10th December—6 months for inrolment.

George Mordey Mowbray, of Paternoster-row, London, wholesale druggist, for an improved method of communication between the person or persons having the charge of a railway train and the controller of its motive power. Sealed 10th December—6 months for inrolment.

Robert William Thomson, of Adam-street, Adelphi, civil engineer, for an improvement in carriage-wheels; which is also applicable to other rolling bodies. Sealed 10th December—6 months for inrolment.

Henry Lawrence, of Wigmore-street, Cavendish-square, Gent., for an improved buckle, suitable for harness and other purposes. Sealed 10th December—6 months for inrolment.

George Leach Ashworth, of Rochdale, Lancashire, cotton-spinner, and Wilson Crossley, of the same place, manager, for certain improvements in machinery or apparatus for preparing and spinning cotton and other fibrous substances. Sealed 10th December—6 months for inrolment.

James Garforth, of Dukinfield, Chester, engineer, for improvements in machinery or apparatus for connecting metallic plates for the construction of boilers and other purposes. Sealed 10th December—6 months for inrolment.

Alfred Vincent Newton, of the Office for Patents, 66, Chancery-lane, Middlesex, mechanical draughtsman, for improvements in printing and dyeing various fabrics,—being a communication. Sealed 10th December—6 months for inrolment.

Christopher Dunkin Hays, of Bermondsey, master mariner, for improvements in the construction and adaptation of apparatus for propelling and steering vessels on water. Sealed 10th December—6 months for inrolment.

Charles Dowse, of Camden-town, Gent., for an improved paper or material. Sealed 10th December—6 months for inrolment.

William Mushet and Robert Mushet, iron-founders, of Dalkeith, Scotland, for improvements in moulding iron. Sealed 10th December—6 months for inrolment.

Thomas Victor Allier, of Quai St. Michael, in the city of Paris, Gent., for improvements in breaks or machinery for stopping or retarding carriages. Sealed 10th December—6 months for inrolment.

Frederick Gye, jun., of South Lambeth, in the county of Surrey, Gent., for his invention of improvements in preparing aerated waters, and in vessels to contain aerated and mineral water.—Sealed 10th December—6 months for inrolment.

Moses Poole, of Searle-street, London, Gent., for improvements iu apparatus to be used for drawing and marking,—being a communication. Sealed 10th December—6 months for inrolment.

William Mc Naught, of Robertson-street, Glasgow, in Scotland, engineer, for certain improvements in the steam-engine. Sealed 10th December—6 months for inrolment.

Isaac Hawker Bedford, of Birmingham, in the county of Warwick, for improvements in the manufacture of window and other glass,—being a communication. Sealed 12th December—6 months for inrolment.

Moses Poole, of Serle-street, London, Gent., for improvements in filling bottles and other vessels, and also in covering, stopping, or securing liquids and other matters in bottles and other vessels,—being a communication. Sealed 12th December—6 months for inrolment.

Samuel Cunliffe Lister, of Manningham, in the county of York, Gent., for his invention of improvements in carding, combing, and spinning wool. Sealed 12th December—6 months for inrolment.

Thomas Findler, of Glasgow, in the county of Lanark, flint miller, for his invention of a new invention or improvements in the construction and operation of certain parts of fliut grinding mills, and other grinding mills, or machinery for grinding. Sealed 15th December—6 months for inrolment.

John Robert Johnson, of Nelson-square, in the county of Surrey, chemist, for his invention of improvements in purifying gas, and in the treatment of products of gas works. Sealed 20th December—6 months for inrolment.

Henry Mandeville Meade, of the city of New York, in the United States of America, Gent., for improvements in the manufacture of bread,—being a communication. Sealed 20th December—6 months for inrolment.

George Fergusson Wilson, of Belmont, Vauxhall, in the county of Surrey, Gent.; George Gwynne, of Regent-street, Middlesex, Gent.; and James Pillans Wilson, of Belmont, aforesaid, Gent., for their invention of improvements in treating certain inflammable matters; and in the manufacture of candles. Sealed 20th December—6 months for inrolment.

William Hannis Taylor, of Piccadilly, in the county of Middlesex, Gent., and Francis Roubiliac Conder, of Birmingham, in the County of Warwick, civil engineer, for their invention of certain improvements in propelling. Sealed 20th December—6 months for inrolment.

Jabez Church, of Colchester, in the county of Essex, gas engineer, for his invention of improvements in the manufacture of coke, and in the ovens for producing the same. Sealed 20th December—6 months for inrolment.

John Blyth, of Limehouse, in the county of Middlesex, engineer, for certain improvements in diminishing the risk of accidental explosions of gunpowder and other substances which are liable to explode or ignite by contact with fire. Sealed 20th December—6 months for inrolment.

William Mac Lardy, of Salford, in the county of Lancaster, manager, for certain improvements in machinery or apparatus applicable to the preparation and spinning of cotton, wool, silk, flax, and other fibrous substances. Sealed 22nd December—6 months for inrolment.

Alfred Vincent Newton, of the Office for Patents, 66, Chancery-lane, Middlesex, mechanical draughtsman, for improvements in combing wool,—being a communication. Sealed 22nd December—6 months for inrolment.

Samuel Heseltine, jun., of Bromley, in the county of Middlesex, civil engineer, for improvements in machinery or apparatus for dressing stones, for grinding corn, grain, and other substances,—being a communication. Sealed 22nd December—6 months for inrolment.

Philip Smith, of High-street, Lambeth, in the county of Surrey, locksmith, for improvements in locks, latches, and other similar fastenings. Sealed 22nd December—6 months for inrolment.

Henry Pershouse, of Birmingham, manufacturer, for a certain improvement or certain improvements in apparatus used in connection with writing, and also in attaching postage stamps and labels. Sealed 23rd December—6 months for inrolment.

John Penn, of Greenwich, in the county of Kent, engineer, and manufacturer of steam-engines; William Hartree, the younger, and John Matthew, of Greenwich, aforesaid, engineers, for certain improvements in steam-engines and machinery for propelling vessels, which improvements are also applicable for other purposes. Sealed 23rd December—6 months for inrolment.

William Cole, of Coventry, in the county of Warwick, warehouseman, for certain improvements in looms. Sealed 23rd December—6 months for inrolment.

John Dearman Dunnicliff, of Nottingham, lace manufacturer, and William Bull Dexter, of the same place, lace maker, for improvements in the manufacture of warp fabrics. Sealed 24th December—6 months for inrolment.

Wilton George Turner, of Gateshead, in the county of Durham, Doctor in Philosophy, for an improved mode of treating guano for the purpose of obtaining chemical compounds therefrom. Sealed 24th December—6 months for inrolment.

Charles William Siemens, of Finsbury-square, Middlesex, engineer, for improvements in steam-engines, and improvements in regulating the power and velocity of machines for communicating power. Sealed 24th December—6 months for inrolment.

Daniel Towers Shears, of Bankside, Southwark, for improvements in the treatment of zinc ores, for the purpose of producing zinc ingots, which improvements are applicable to the reduction of other ores and metals. Sealed 24th December—6 months for inrolment.

CELESTIAL PHENOMENA FOR JANUARY, 1846.

H.	M.	S.	
1			Clock before the sun, 3m. 50s.
—			☽ rises 9h. 55m. M.
—			☽ passes mer. 3h. 39m. A.
—			☽ sets 9h. 13m. A.
	7	53	♂ in the ascending node
10	44		☉ in Perigee
12	19		♂ in conj. with ♅ diff. of dec. 0. 46. S.
2	12	57	♃'s third sat. will im.
3	4	48	☿ greatest hel. lat. N.
	15	58	♅ in conj. with the ☽ diff. of dec. 4. 4. S.
	18	19	♂ in conj. with the ☽ diff. of dec. 3. 9. S.
4	2	25	☽ in □ or first quarter
5			Clock before the sun 5m. 41s.
—			☽ rises 11h. 37m. M.
—			☽ passes mer. 6h. 47m. A.
—			☽ sets 1h. 0m. M.
	11	36	♃ in conj. with the ☽ diff. of dec. 2. 28. S.
	12	55	♃'s first sat. will em.
6	6	17	♃'s second sat. will em.
	8	43	♃'s second sat. will em.
6	21	26	☿ stationary
7	7	24	♃'s first sat. will em.
7	22	5	♀ in the ascending node
8			Occul. ε Tauri, im. 5h. 0m. em. 6h. 4m.
10			Clock before the sun, 7m. 49s.
—			☽ rises 2h. 49m. A.
—			☽ passes mer. 10h. 51m. A.
—			☽ sets 6h. 5m. M.
—			Occul. e2 Orionis, im. 6h. 49m. em. 8h. 1m.
12	19		☽ in Apogee
12	2	2	Ecliptic oppo. or ○ full moon.
13			Occul. a2 Cancri, im. 10h. 12m. em. 11h. 14m.
—			Occul. a1 Cancri, im. 16h. 30m. em. 16h. 53m.
	8	52	♃'s second sat. will im.
	11	19	♃'s second sat. will em.
14	9	20	♃'s first sat. will em.
15			Clock before the sun, 9m. 42s.
—			☽ rises 7h. 53m. A.
—			☽ passes mer. 1h. 53m. M.
—			☽ sets 8h. 47m. M.
16			Occul. p4 Leonis, im. 16h. 54m.
16	9		Pallas in conj. with ♄ diff. of dec. 13m. 27s. N.
17			Mercury R. A. 18h. 12m. dec. 21. 55. S.
—			Venus R. A. 22h. 47m. dec. 6. 20. S.
—			Mars R. A. 1h. 0m. dec. 6. 48. N.
—			Vesta R. A. 4h. 2m. dec 16. 33. N.
—			Juno R. A. 14h. 52m. dec. 8. 52. S.
—			Pallas R. A. 21h. 25m. dec. 2. 52. S.
—			Ceres R. A. 23h. 8m. dec. 15. 4. S.
—			Jupiter R. A. 1h. 59m. dec. 10. 59. N.
—			Saturn R. A. 21h. 25m. dec. 16. 18. S.
—			Georg. R. A. 0h. 26m. dec. 2. 4. N.
—			Mercury passes mer. 22h. 26m.
—			Venus passes mer. 3h. 0m.
—			Mars passes mer. 5h. 14m.
—			Jupiter passes mer. 6h. 12m.
—			Saturn passes mer. 1h. 39m.
—			Hers. passes mer. 4. 39.
18	—		Occul. λ Virginis, im. 11h. 40m. em. 12h. 24m.
18	2	52	☿ greatest elong. 24. 12. W.
20			Clock before the sun, 11m. 19s.
—			☽ rises 0h. 18m. M.
—			☽ passes mer. 5h. 32m. M.
—			☽ sets 10h. 38m. M.
	3	52	☽ in □ or last quarter
	4	17	Vesta stationary
	11	28	♃'s second sat. will em.
21	11	16	♃'s first sat. will em.
21	22	9	♃ in □ with the ☉
23	5	46	♃'s first sat. will em.
25			Clock before the ☉ 12m. 38s.
—			☽ rises 5h. 51m. M.
—			☽ passes mer. 10h. 13m. M.
—			☽ sets 2h. 38m. A.
	7	4	☿ in conj. with the ☽ diff. of dec. 4. 9. S.
26	5	5	♀ at greatest brilliancy
		15	☽ in Perigree
	16	50	☿ in the descending node
27	9	23	Ecliptic conj. or ● new moon
27	20	26	♄ in conj. with ☽ diff. of dec. 6. 21. S.
29	14	25	♀ in conj. with the ☽ diff. of dec. 0. 31. S.
30	7	42	♃'s first sat. will em.
31	1	16	♅ in conj. with the ☽ diff. of dec. 3. 44. S.
	—		Occul. 62 Piscium, im. 7h. 22m. em. 8h. 25m.
	—		Occul. δ Piscium, im. 7h. 54m. em. 8h. 39m.
	5	8	♃'s third sat. will im.
	5	49	♃'s second sat. will em.
	7	9	♃'s third sat. will em.

J. LEWTHWAITE, Rotherhithe.

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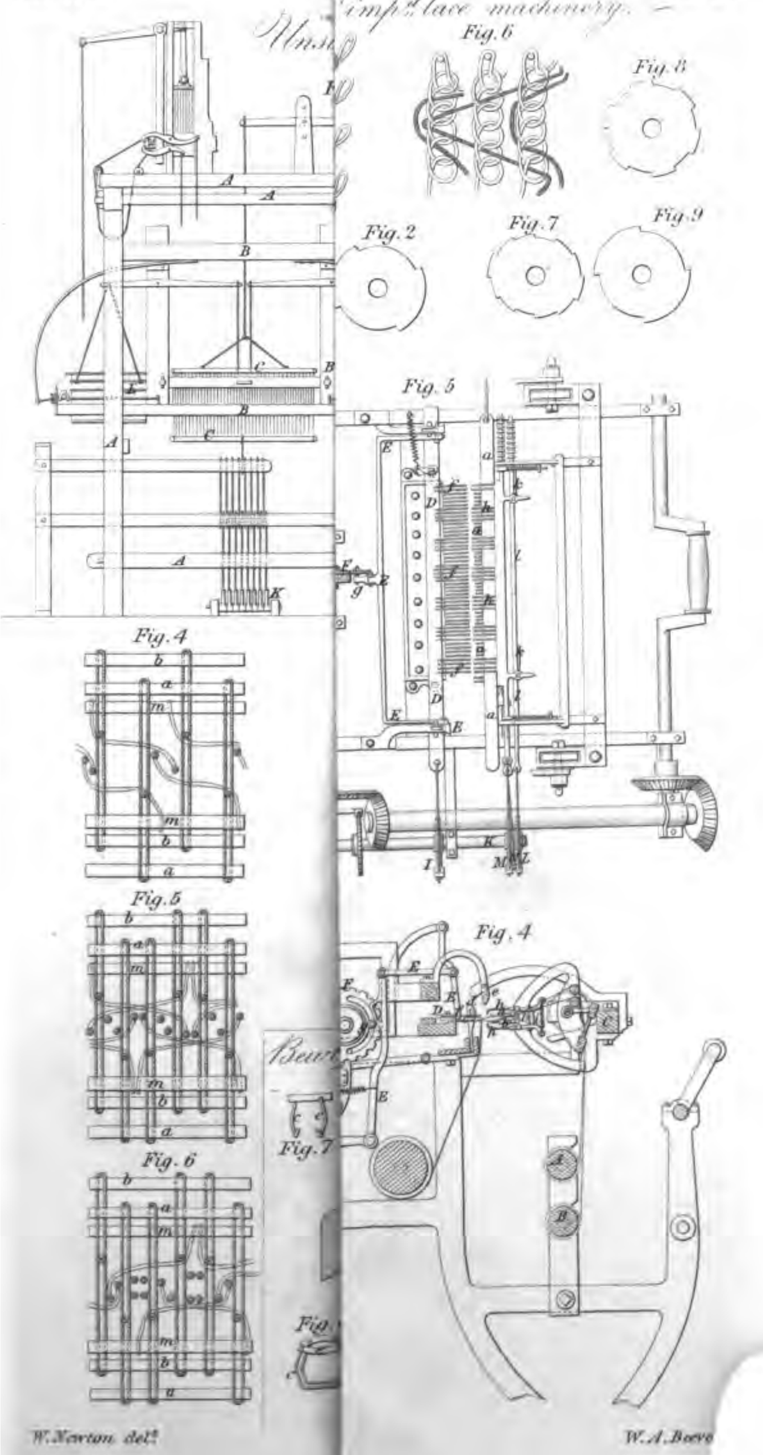
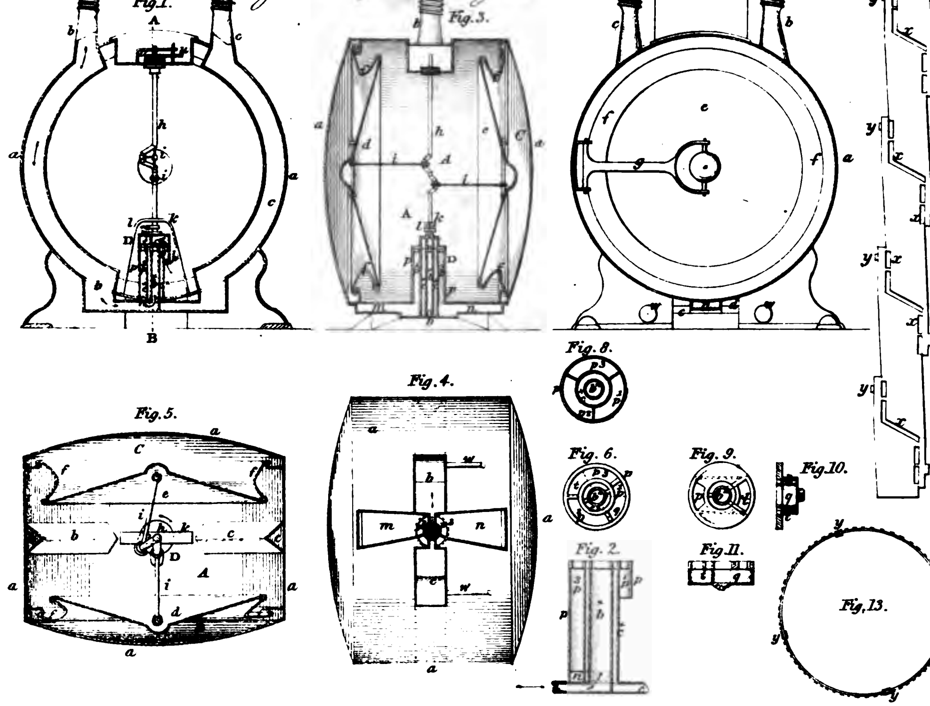
[CONJOINED SERIES.]

PATENTS, REPORTS OF RECENT.

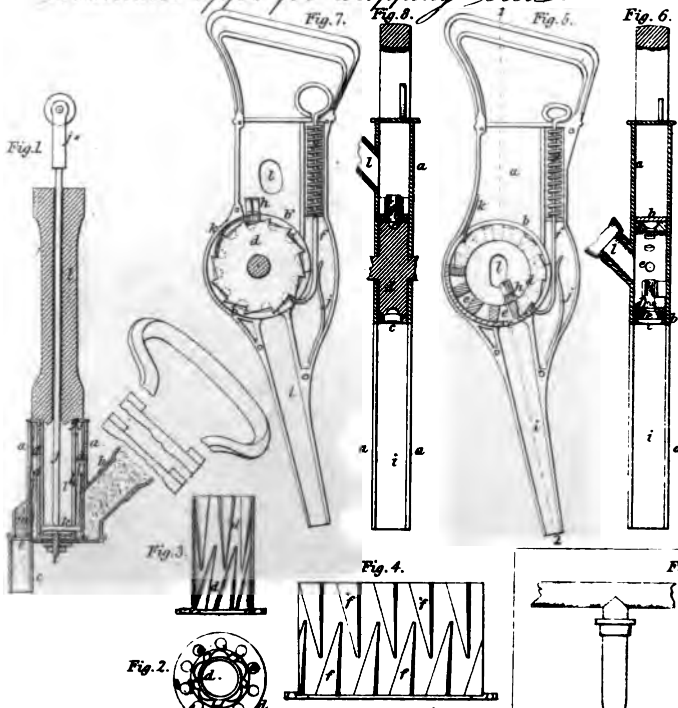


W. Newton del.t W. A. Beeve...

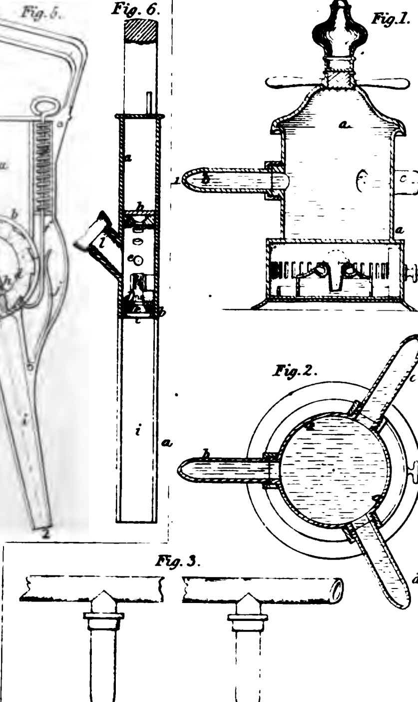
Wright's impts in gas meters.



Bentall's appts for dropping seed.



Cottam's Italian iro



W. Newton del.

1st August 1845.

J. Wood sc.

Flockton's machine for sweeping streets.

Fig. 1.

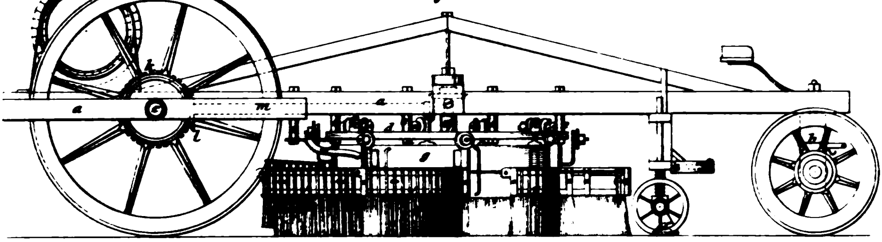


Fig. 2.

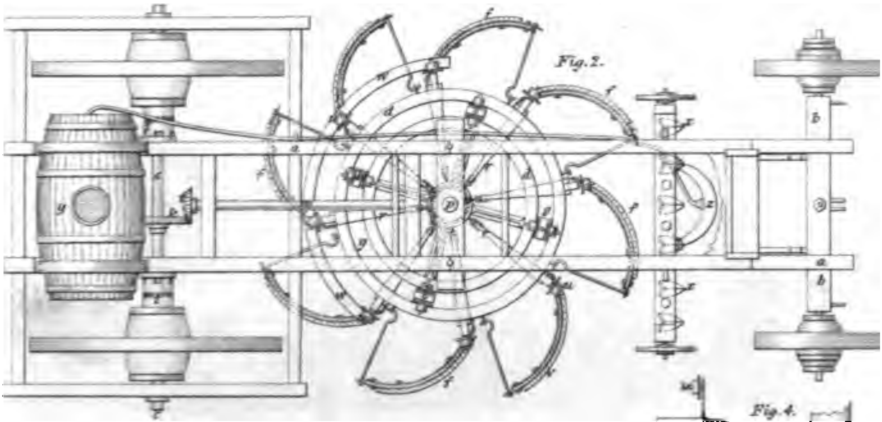


Fig. 4.

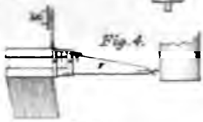
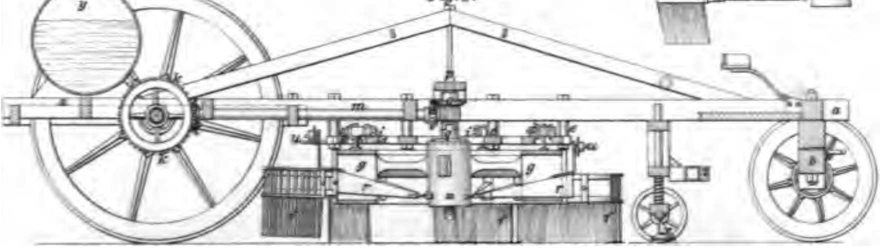


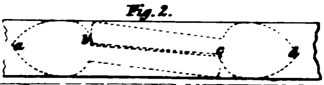
Fig. 3.



Wheeley's imp.ts in making spoons.

Fig. 1.

Fig. 2.



Wall's imp.ts in manuf.g metals.

Fig. 2.

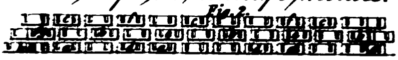
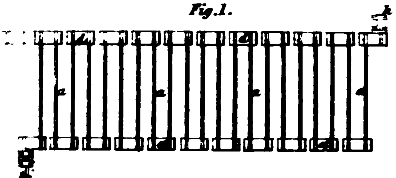


Fig. 1.



Cooper's imp.ts in preserving fruits, &c.

Fig. 1.

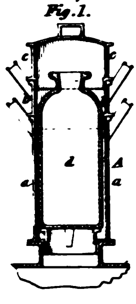


Fig. 6.

Fig. 2.

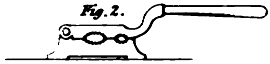


Fig. 4.

Fig 3.

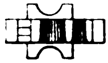
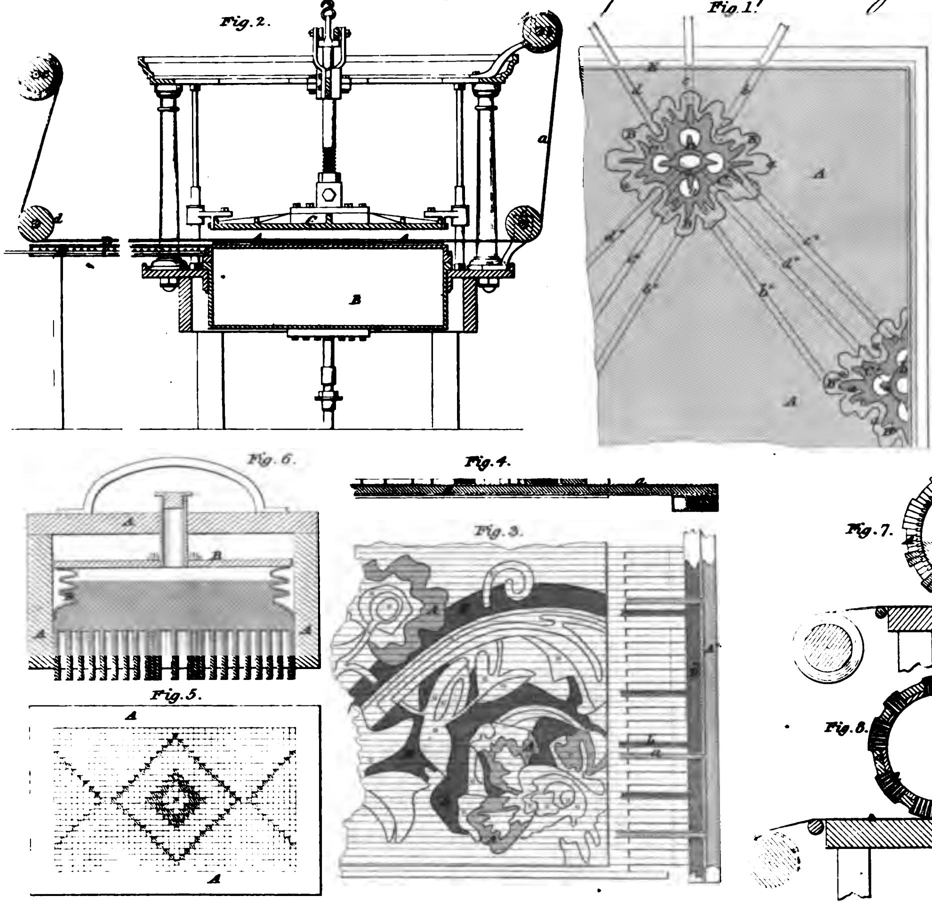
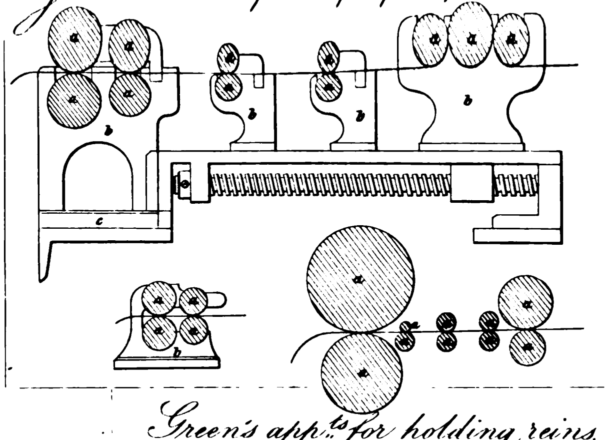
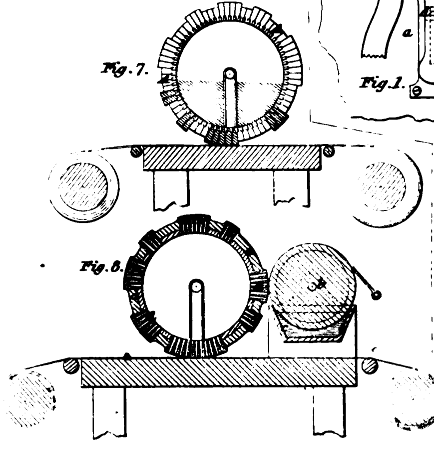


Fig. 5.

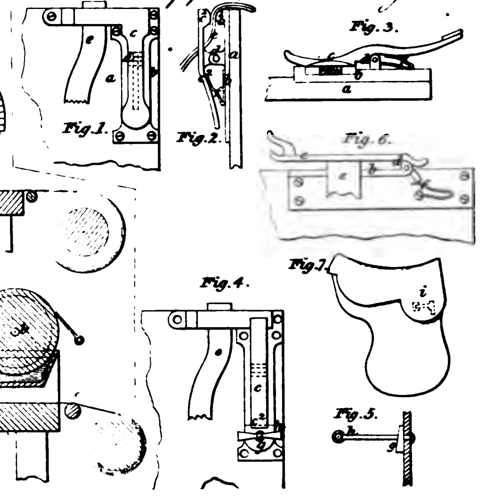
Wood's impts. in printing.





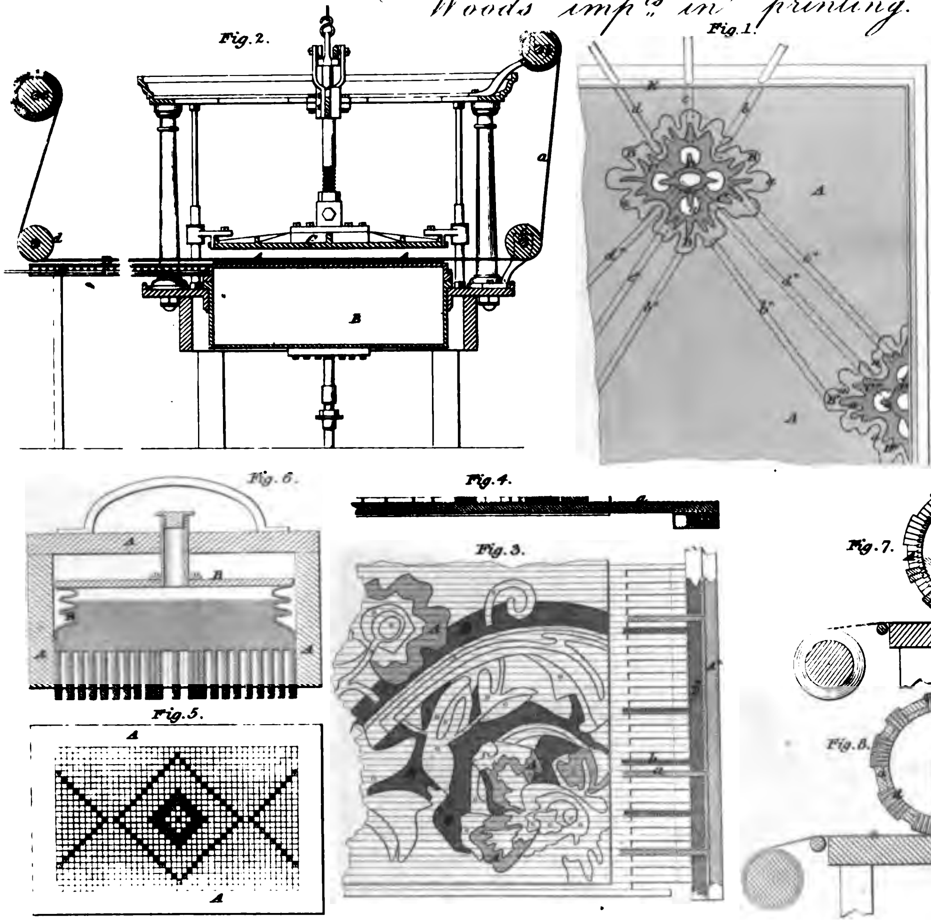


Green's appts. for holding reins.

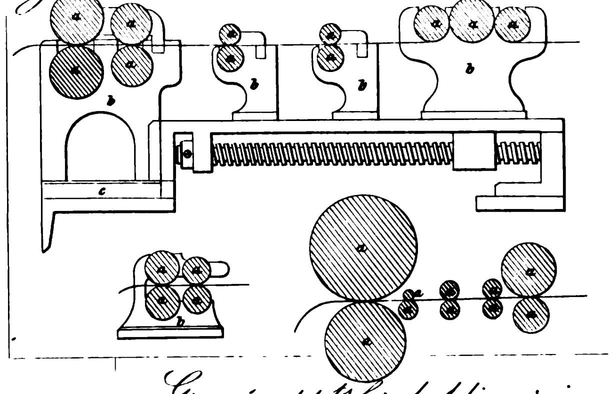


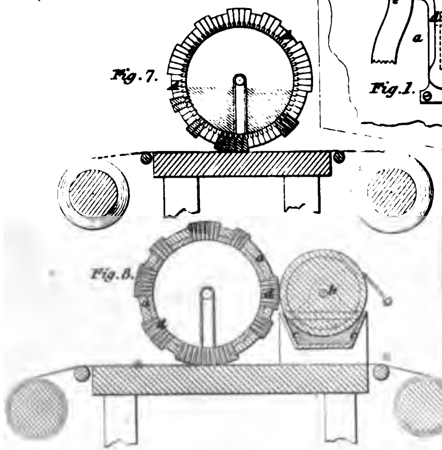
W. Newton del.

Wood's imp^ts in printing.

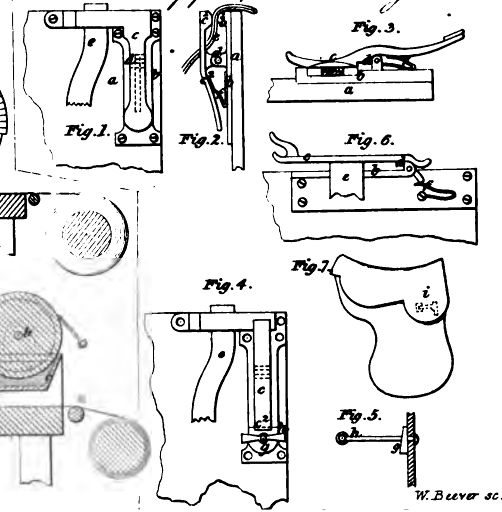


Jenkinson's imp^ts in prepar^g flax, &c.





Green's app^ts for holding reins.



W. Newton del.

7th Sept 1845

W. Beever sc.

Davison & Symington's app^ts for cleansing casks.

Fig. 2.

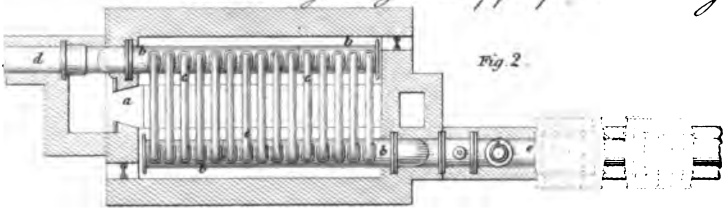


Fig. 5.

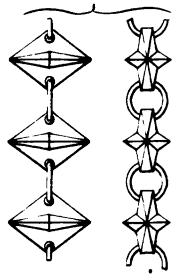


Fig. 1. Fig. 6.

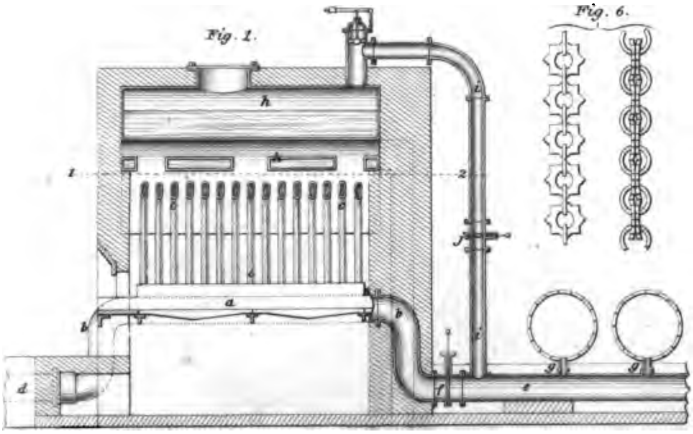


Fig. 4.

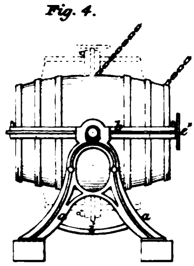
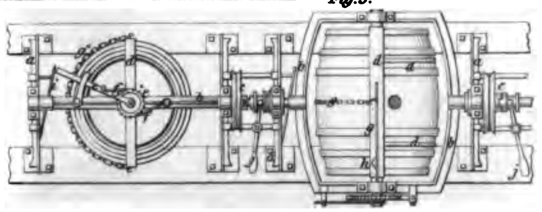
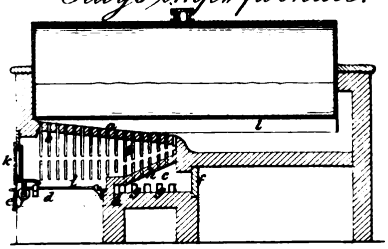


Fig. 3.



Clay's imp^d furnace.



Tarver's app^ts for cutting & grinding.

Fig. 3.

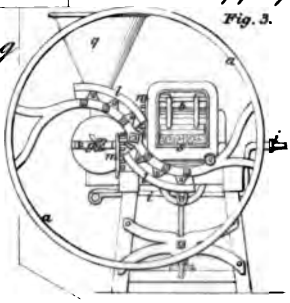


Fig. 1.

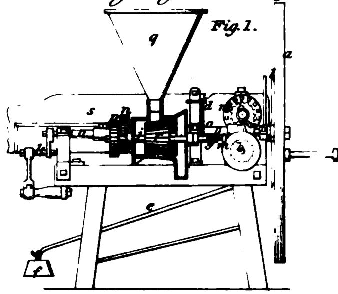
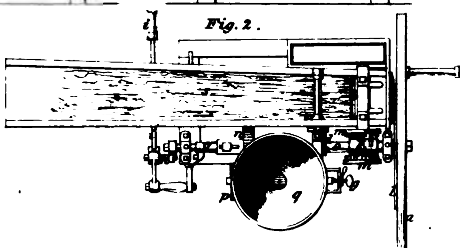


Fig. 2.



Osborne's imp^ts in making iron & steel.

Fig. 2.

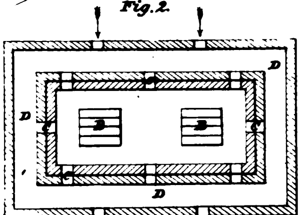
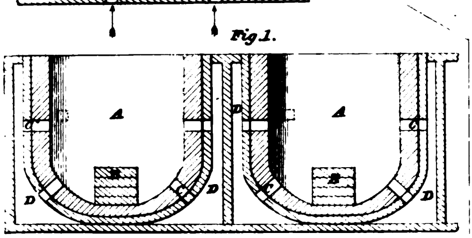
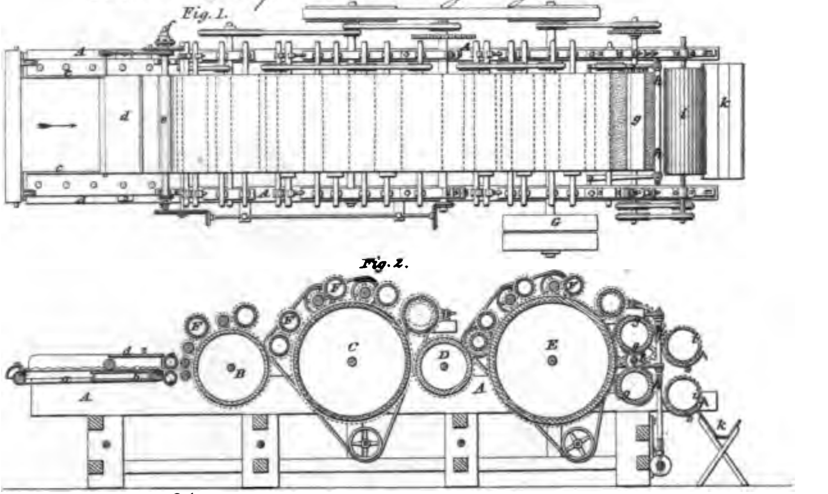


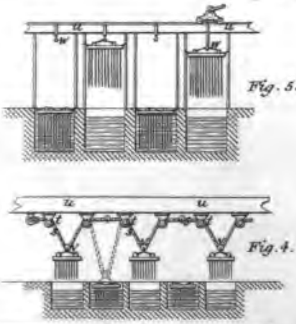
Fig 1.

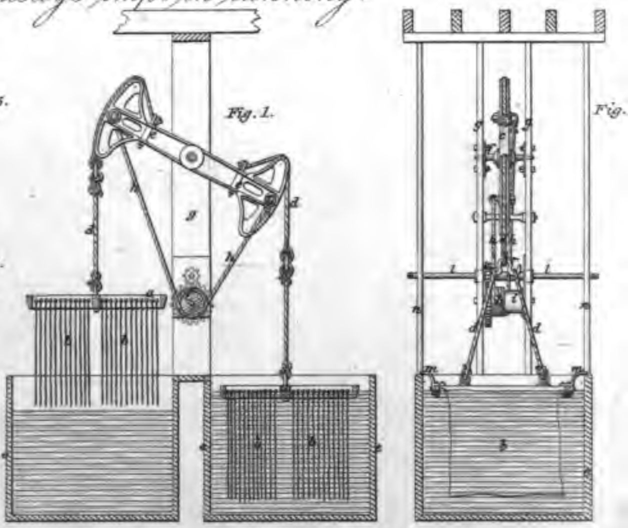


Porritt's impts in carding engines.

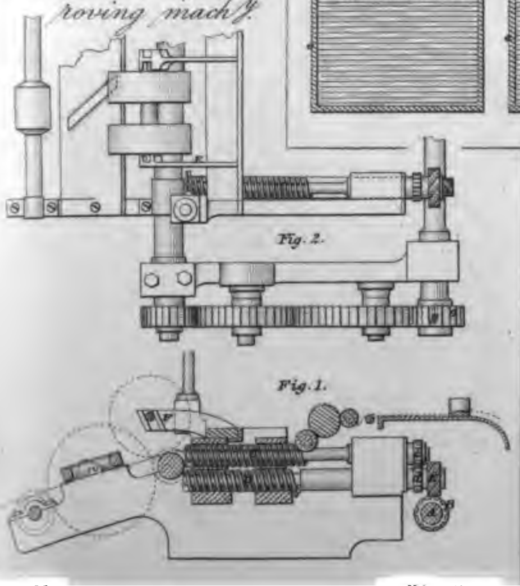


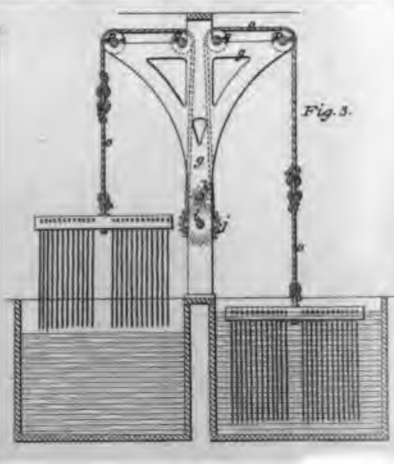
Keasley's impts in tanning.





Fairbairn's impd roving machy.





Irving's mach^y. for cutting wood & stone.

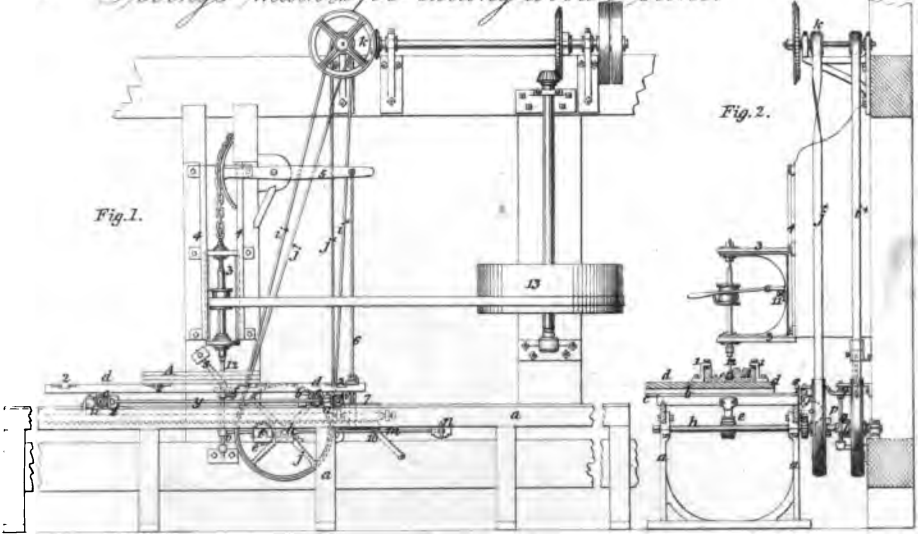


Fig. 3.

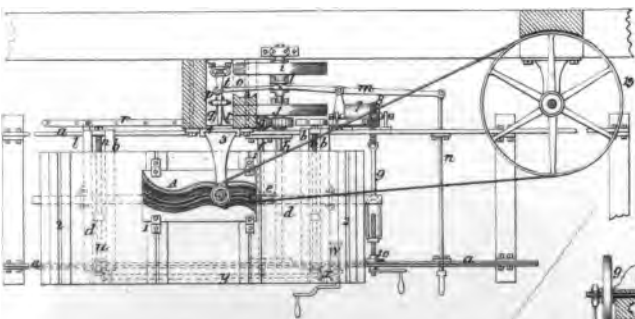


Fig. 4.

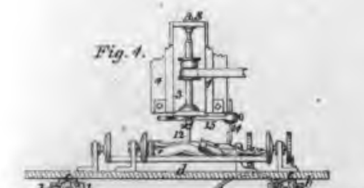
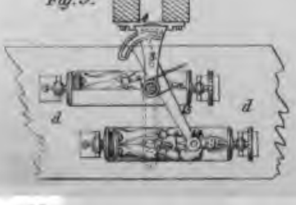
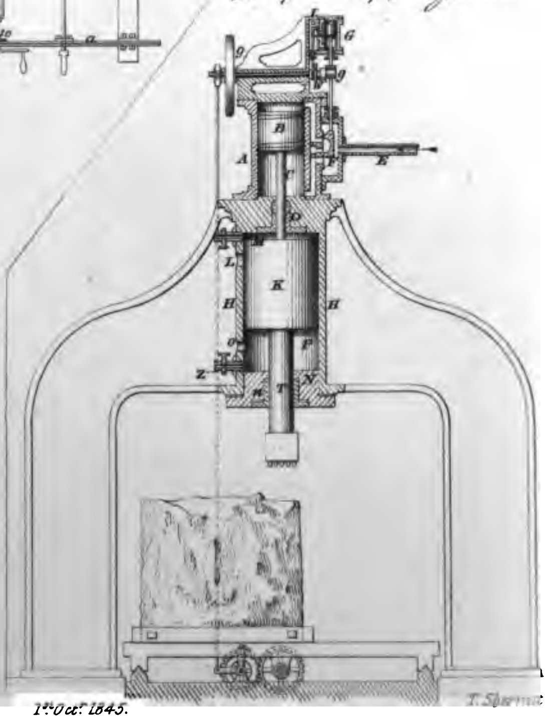


Fig. 5.



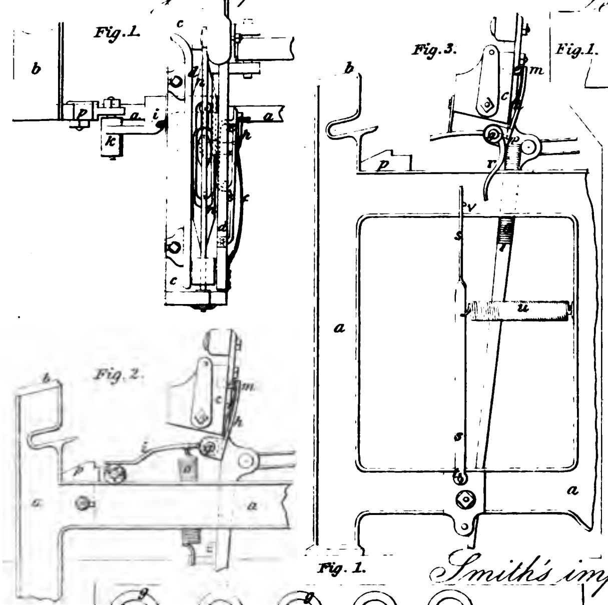
Nasmyth's app^ts. for chipping stone.



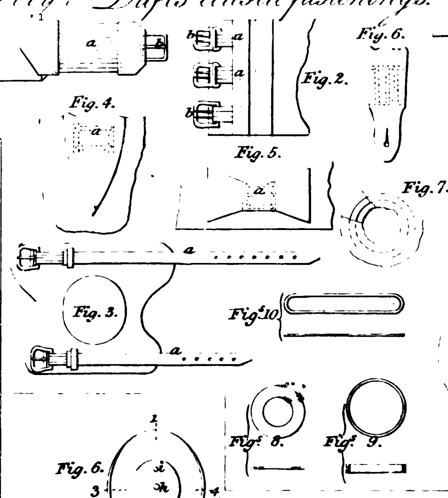
W. Newton del.

1st Oct. 1845.

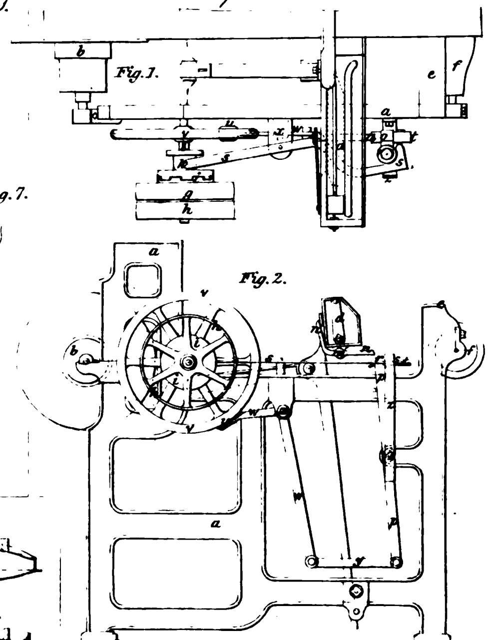
Kenworthy's imp.ts in looms.



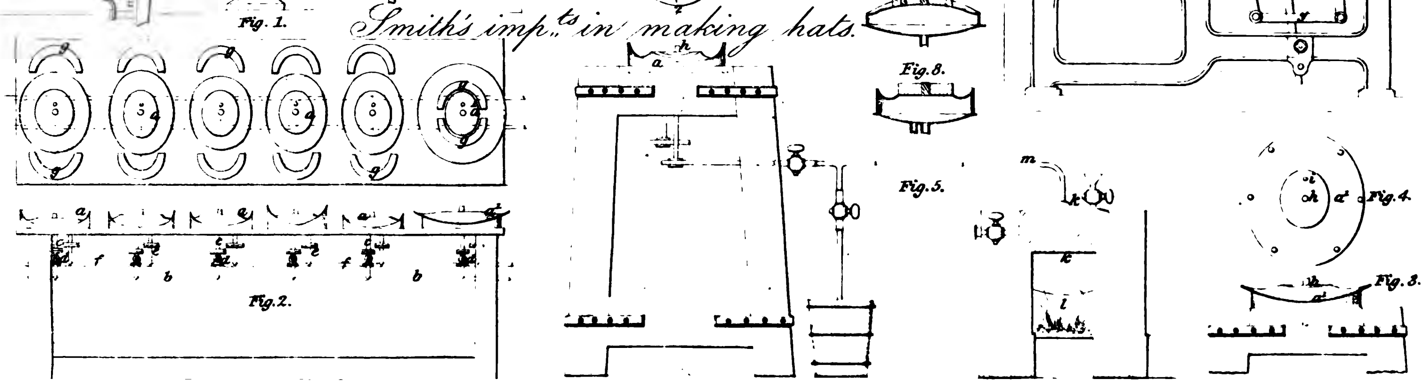
Perry & Duff's elastic fastenings.



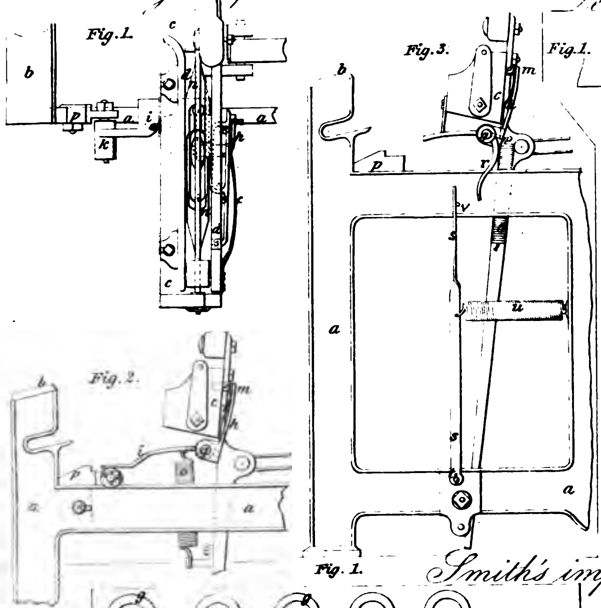
Sellers imp.ts in looms.



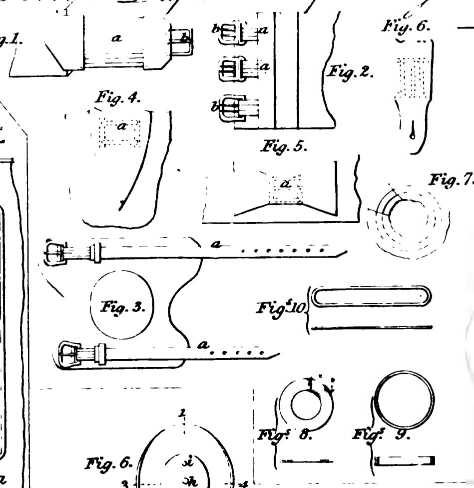
Smith's imp.ts in making hats.



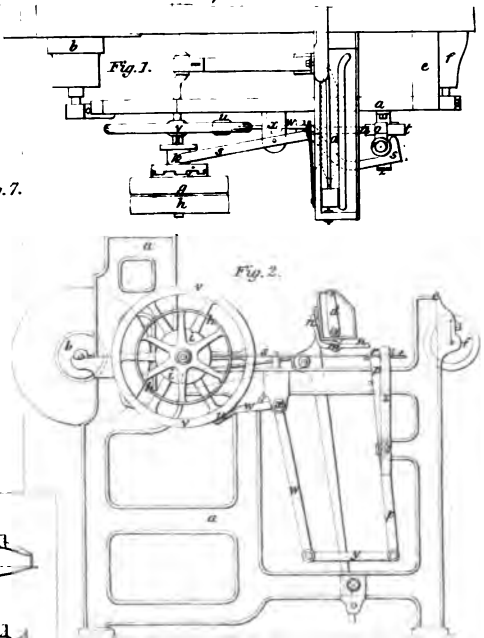
Kenworthy's imp.ts in looms.



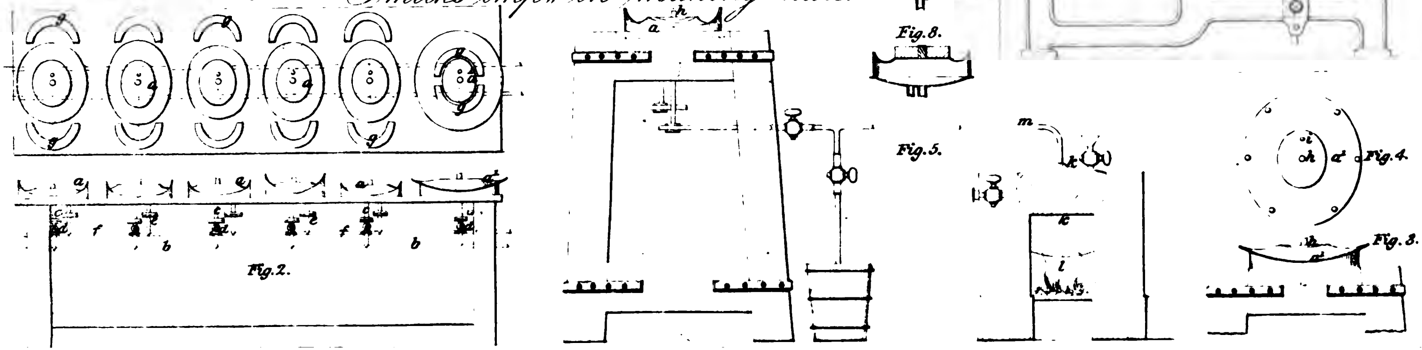
Perry & Duft's elastic fastenings.



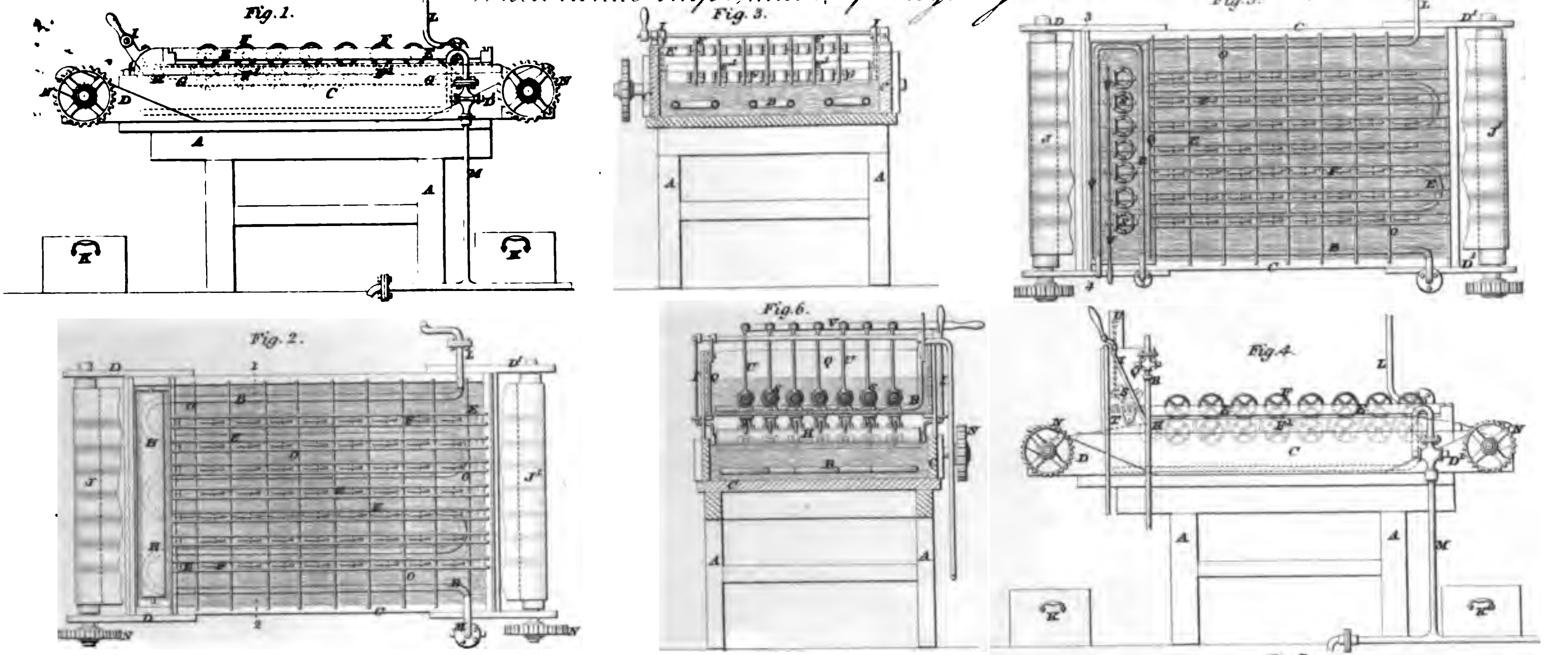
Sellers imp.ts in looms.

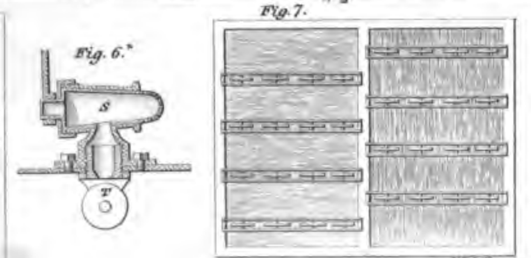


Smith's imp.ts in making hats.

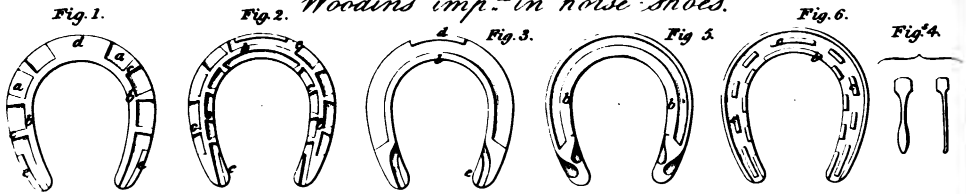


Wallerand's imp.d mach.y for dyeing





Woodin's imp.ts in horse shoes.



Middleton's mach.y for compressing fuel

Fig. 1. Fig. 5. Fig. 3.

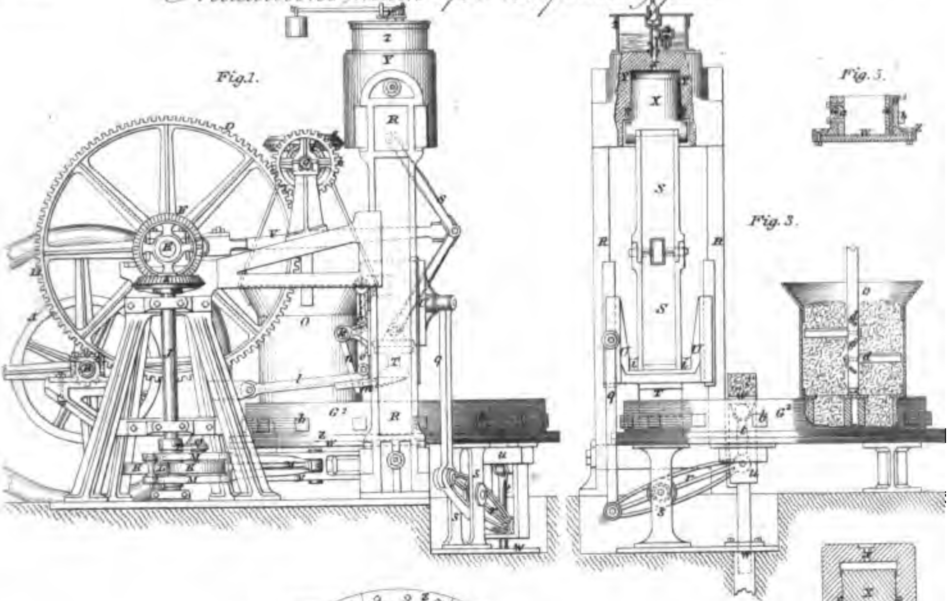


Fig. 2.

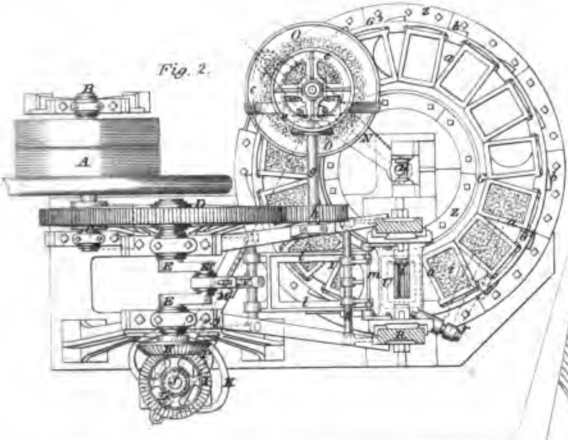


Fig.

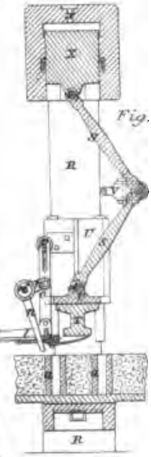
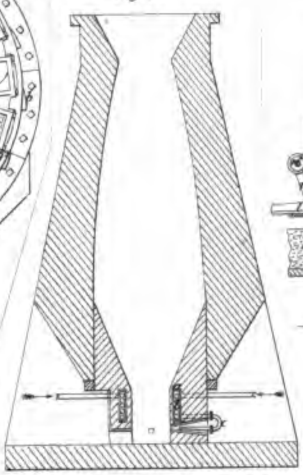


Fig 1



Nickel's imp.ts in elastic webs.

Fig. 5.

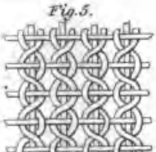
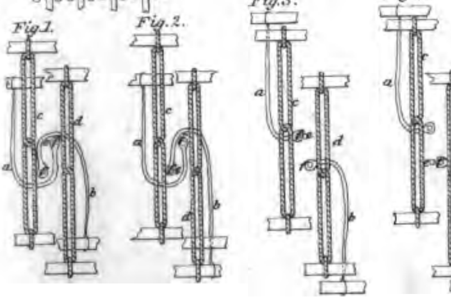


Fig. 1. Fig. 2. Fig. 3. Fig. 4.



Dixon's imp.ts in blast furnaces.

Fig. 1.

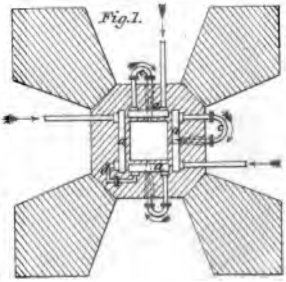
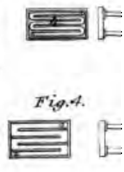
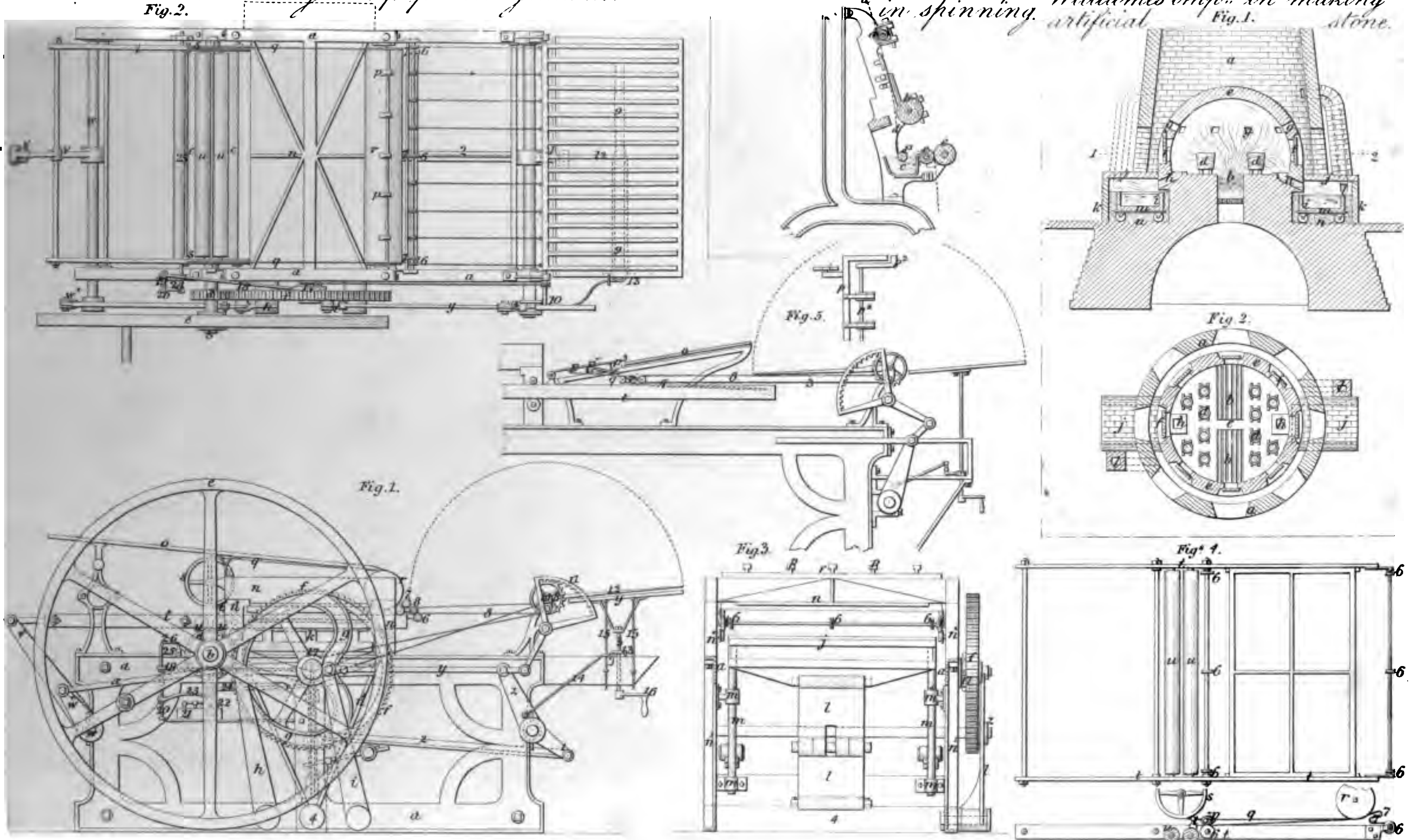


Fig. 3. Fig. 4.

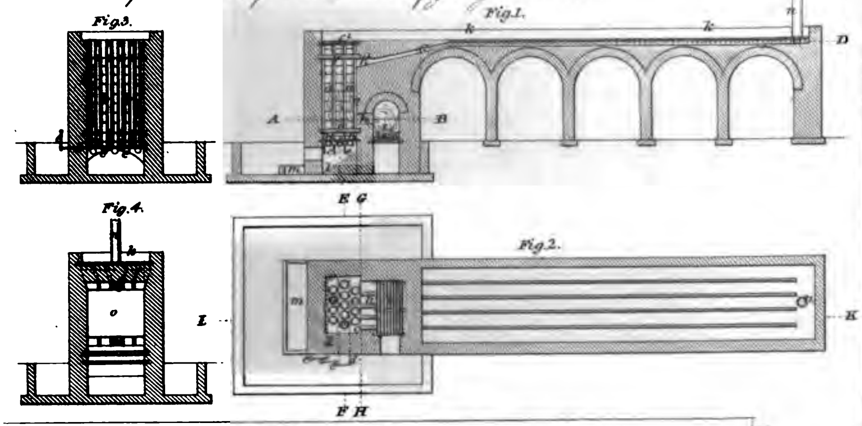


W. Newton del. 1st Nov.r 1845. T. Sperr...

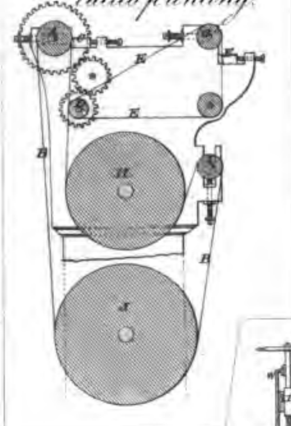
Schnebly's impd printing machy. Russell & Peter's impts in spinning. Williames' impts in making artificial stone.



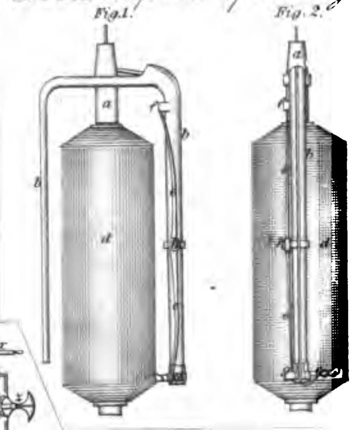
Champion's imp.ts in revivifying animal charcoal.



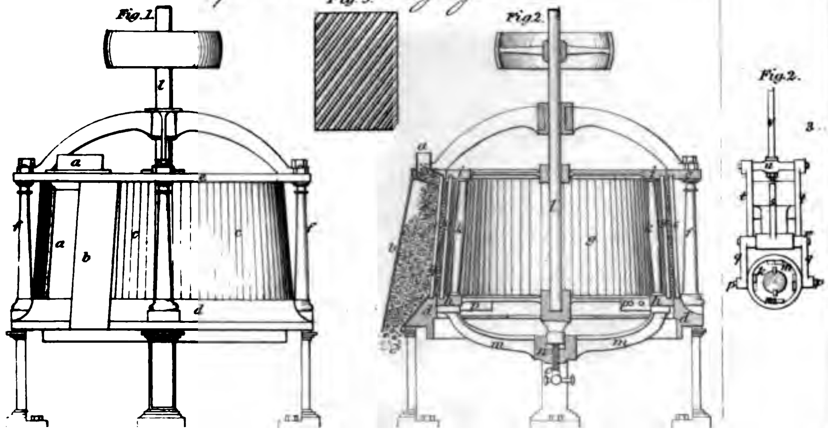
Shepherd's imp.ts in calico printing.



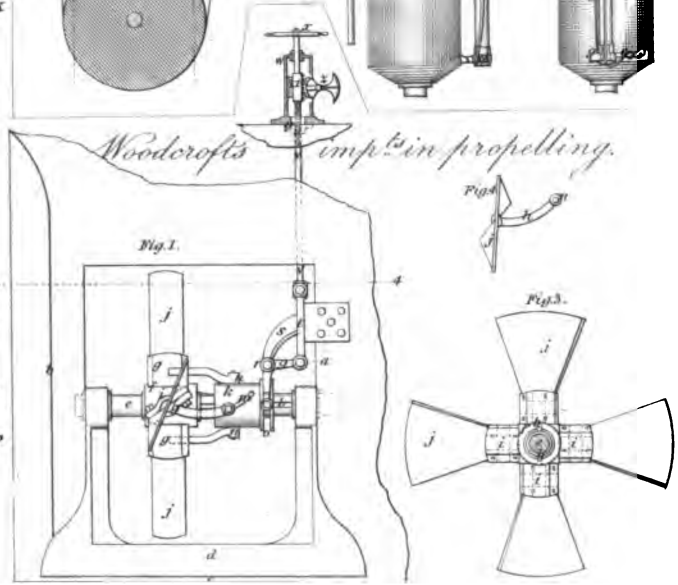
Iver's imp.ts in spinning.



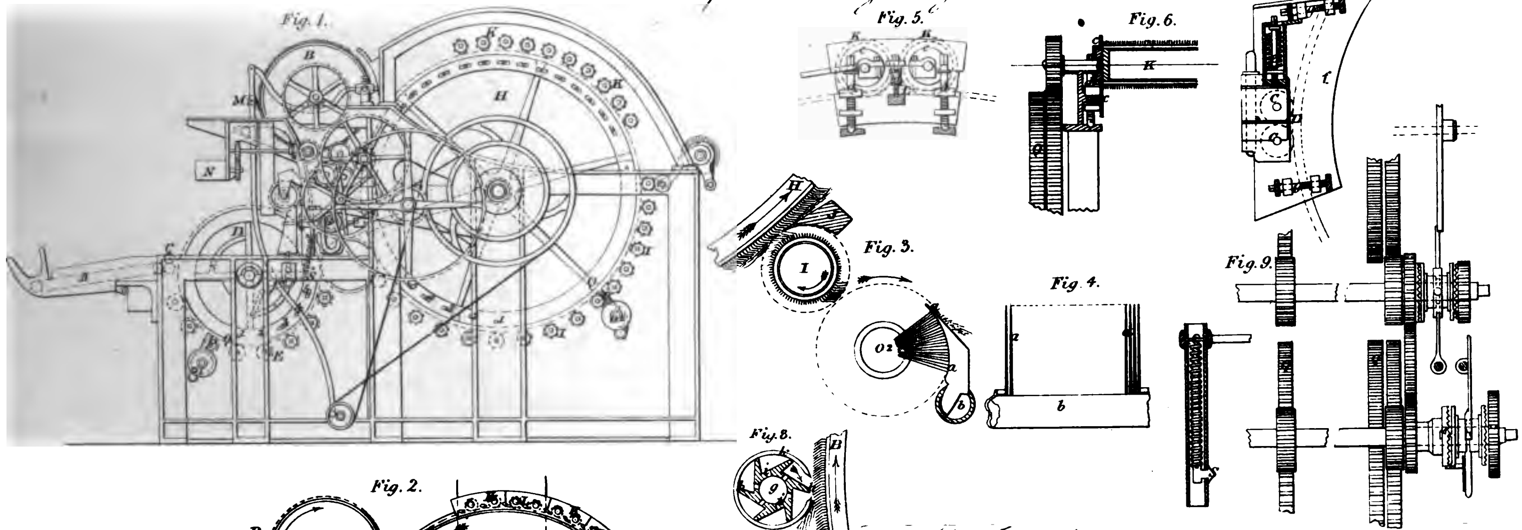
Hick's imp.ts in cleaning grain.

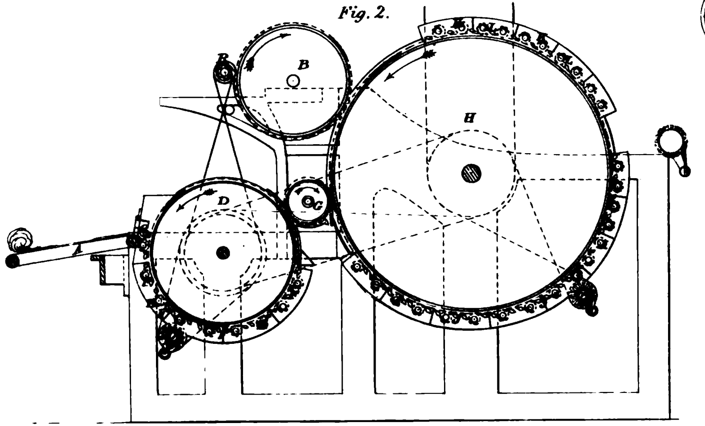


Woodcroft's imp.ts in propelling.

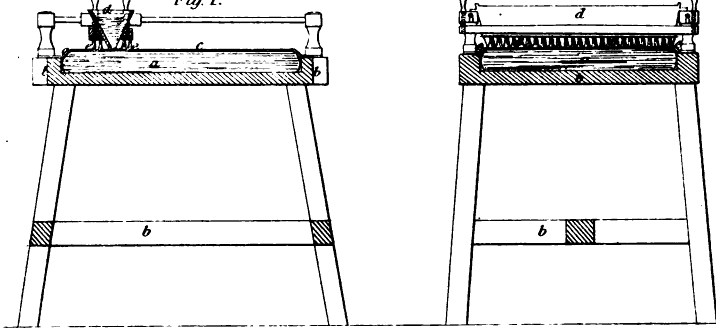


Faulkner's impd. carding engine.



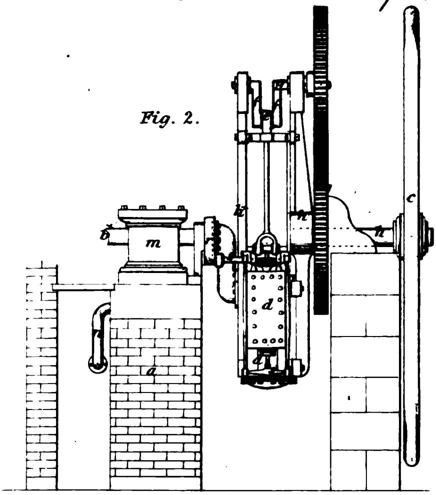


McIntosh's impts. in printing



Haworth's imp.ts in steam engines.

Fig. 2.



Figs 4.

Fig. 3.

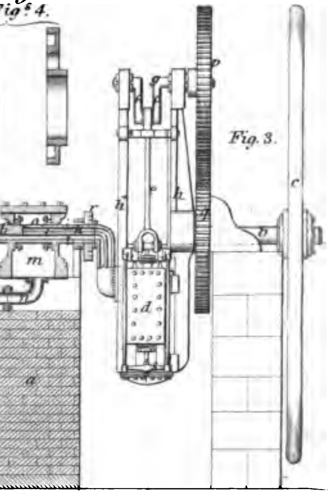
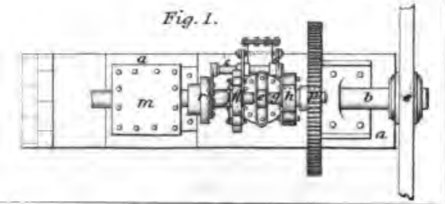


Fig. 1.



Loach's imp.ts in corkscrews & taps.

Fig. 3.

Fig. 2.

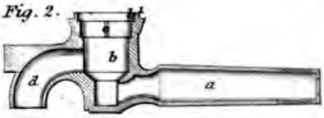


Fig. 1.

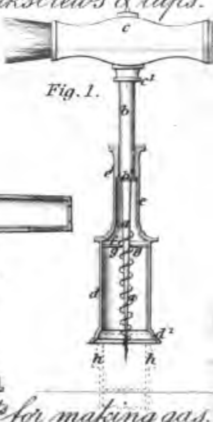


Fig. 5.

Fig. 4.

Newton's imp.d forge hammer.

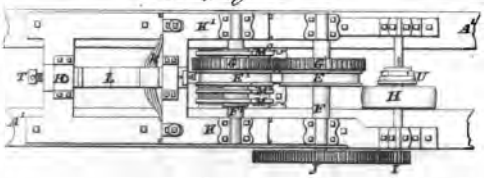
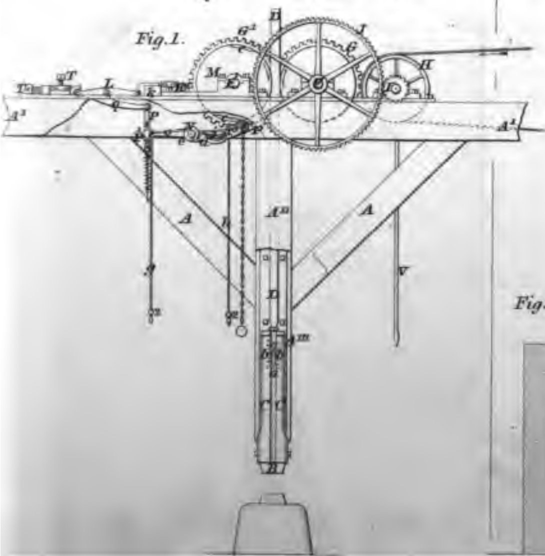


Fig. 1.



Murdoch's app.ts for making gas.

Fig. 2.

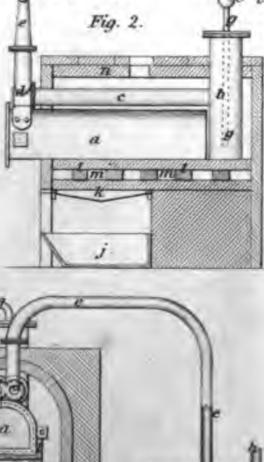
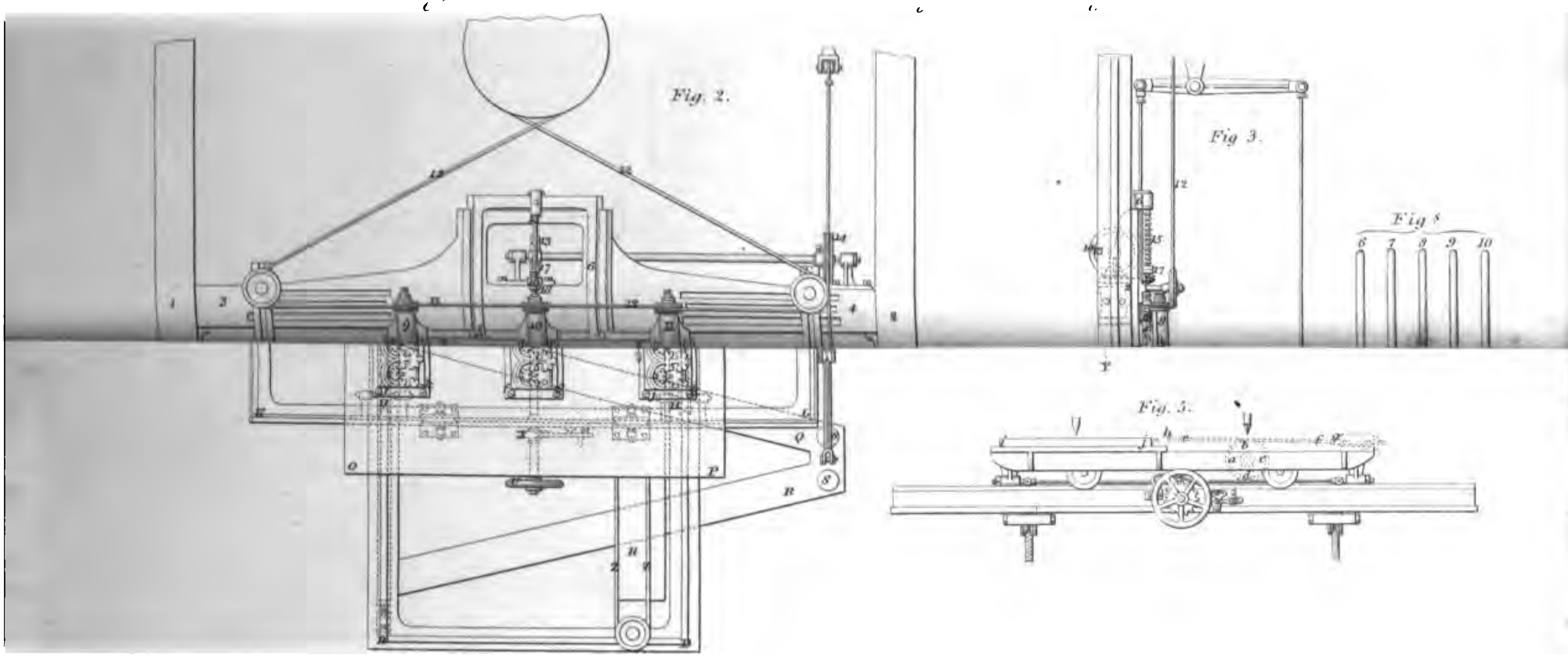


Fig. 1.

Jordan's imp.d mach.y for cutting & carving.



W. Newton del.

Jan.y 1846.

W. A. Beever.

Diggle's imp.ts in looms.

Fig. 2.

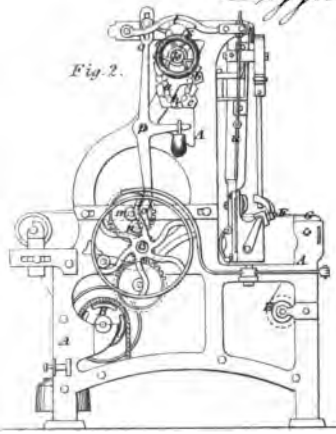


Fig. 1.

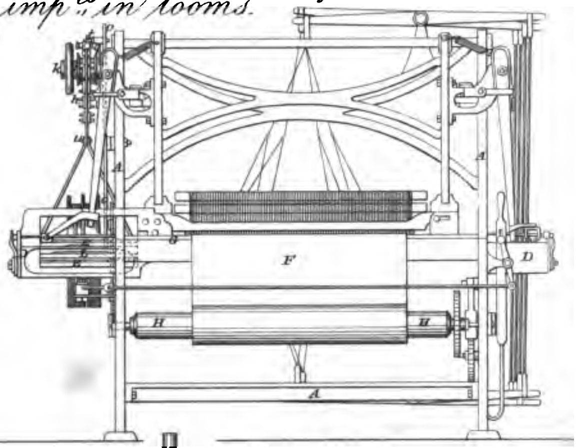


Fig. 3.

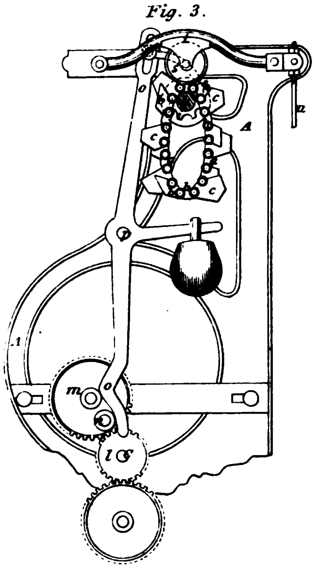
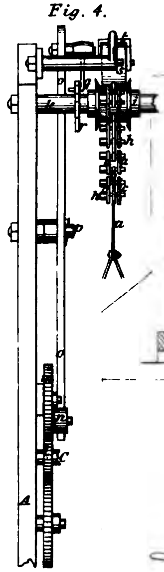
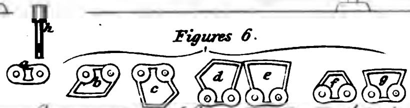


Fig. 4.



Figures 6.



Simpson & Seddon's imp.d kilns.

Fig. 1.

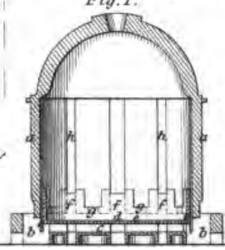
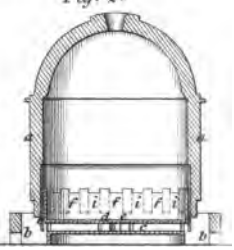


Fig. 2.



Naylor's imp.d clod crusher.

Fig. 1.

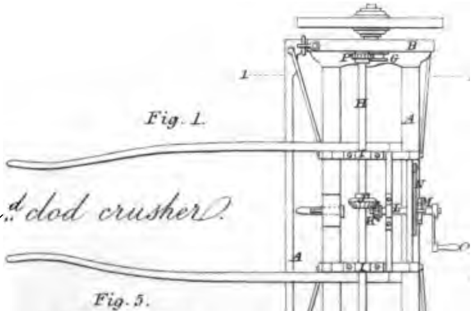


Fig. 3.

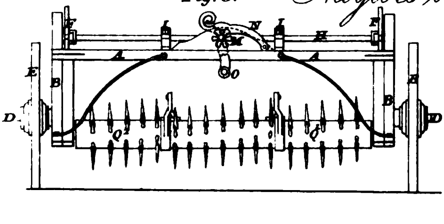


Fig. 5.

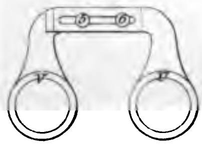


Fig. 4.

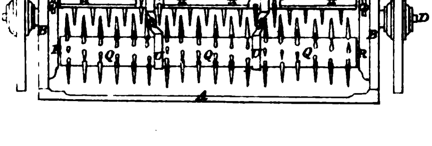


Fig. 6.

Fig. 2.